THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXV. No. 1654.] LONDON, JANUARY 22, 1895. [47TH YEAR. PRICE 6d.

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NEW HIGH-POWER GAS-LIGHT.

INCANDESCENT GAS-LIGHT SYSTEM.

Consumes

3¾ cubic feet per hour.

Gives a light of

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Brilliant Light.

Perfectly Steady and

Noiseless.

Smokeless,

Reduced Heat.

The Ordinary Burner, with Special Globes, is suitable for Lighting Private Houses, Public Houses, Restaurants, Shops, &c.

Special Lamps constructed for Outside Lighting and Street Lighting; and Large Clusters of Lights made for Lighting Halls and large Areas from one centre.

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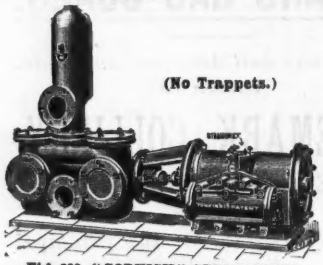

(No Trappets.)

Fig. 600. "CORNISH" STEAM-PUMP FOR WATER.

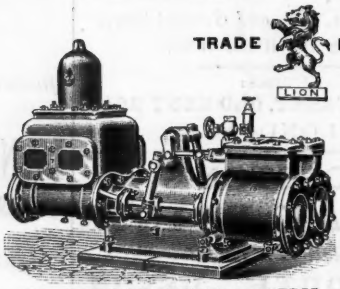

Fig. 670. DUPLEX PUMP FOR GENERAL PURPOSES.

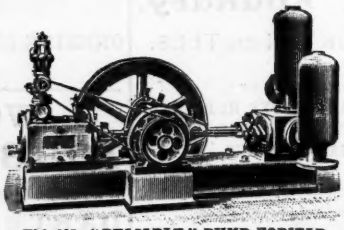

Fig. 685. "RELIABLE" PUMP FOR TAR AND THICK FLUIDS.

Fig. 703. SINGLE RAM PUMP FOR BOILER FEEDING, &c.

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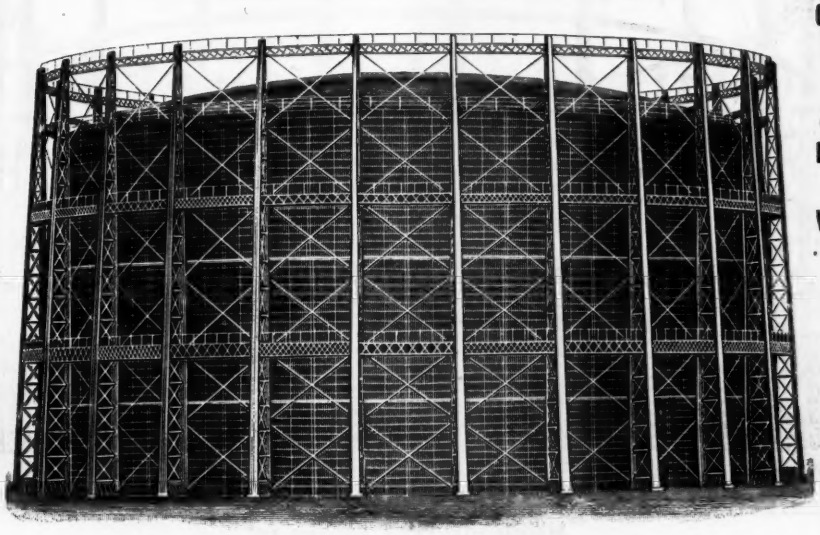

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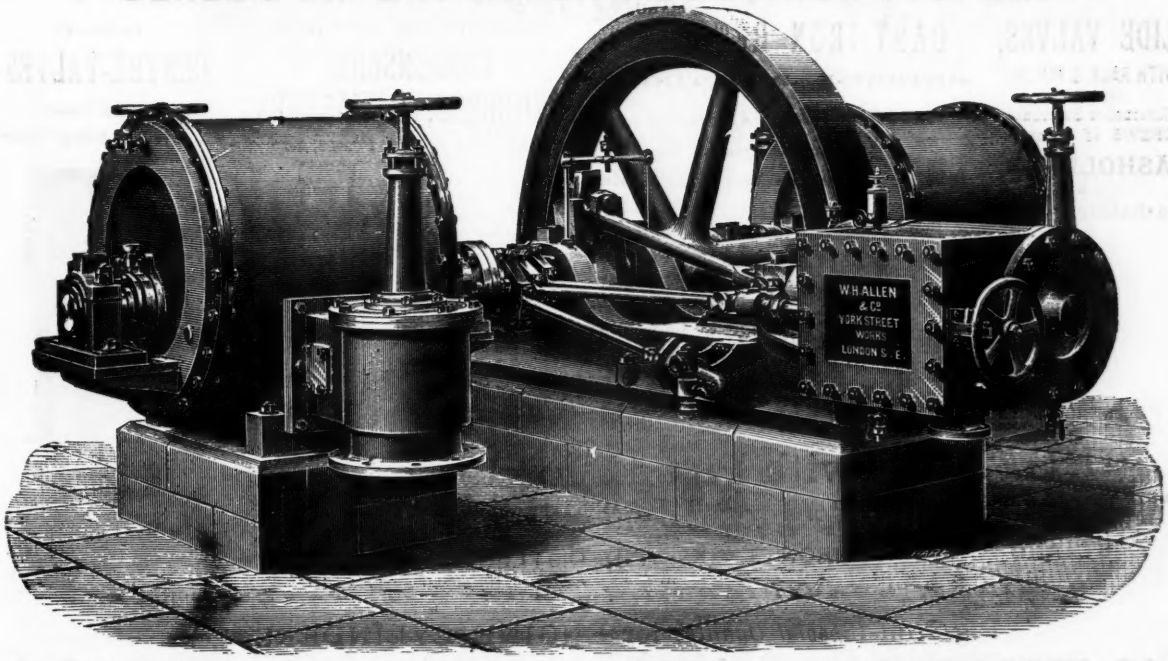

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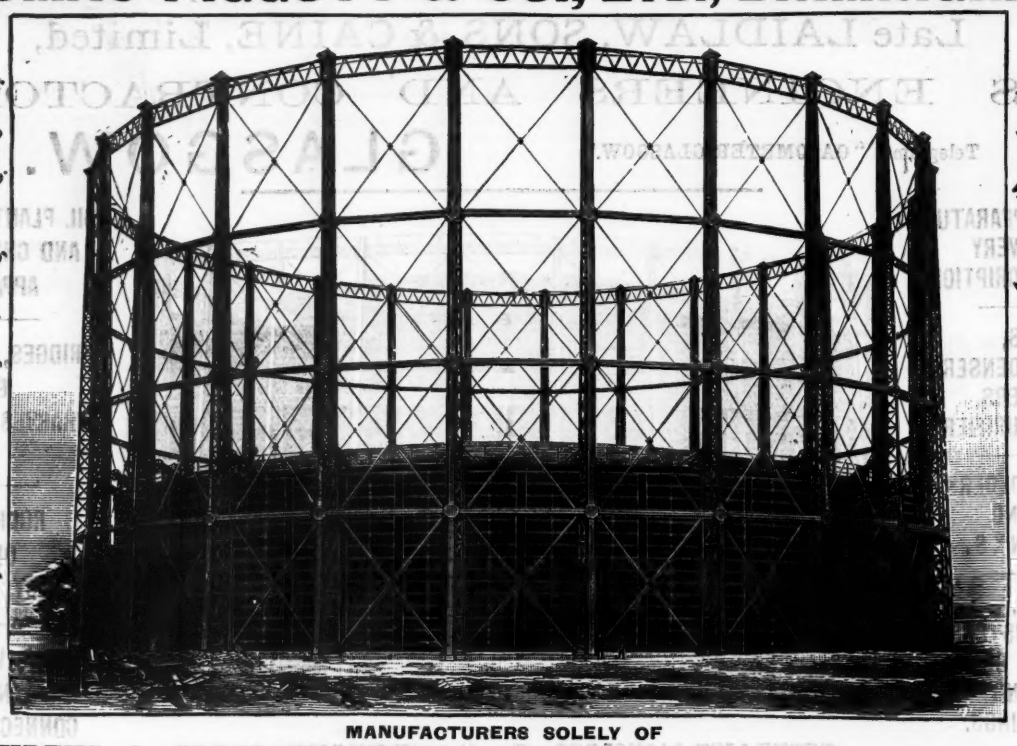

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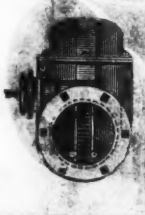

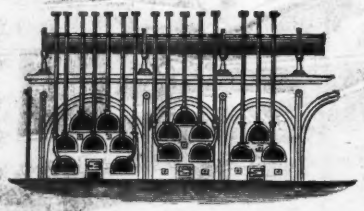

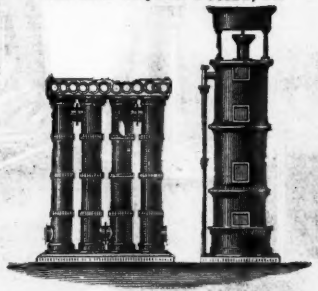

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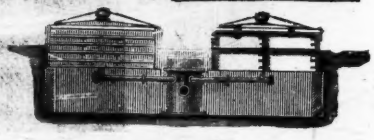

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SAMPLE CARGO will demonstrate the extraordinary value of this Coal, and of the resultant Coke and other Bye-Products.

The unlimited quantity and REDUCED PRICE of this Material makes it the most satisfactory and economical Gas Enricher now available.

COKE.—Briefly the "Bear Creek" Cannel produces a first-class Coke—that is, by itself, and unmixed with Coke from Common Coals—merchantable, comparing favourably with Coke from the Standard Gas Coals.

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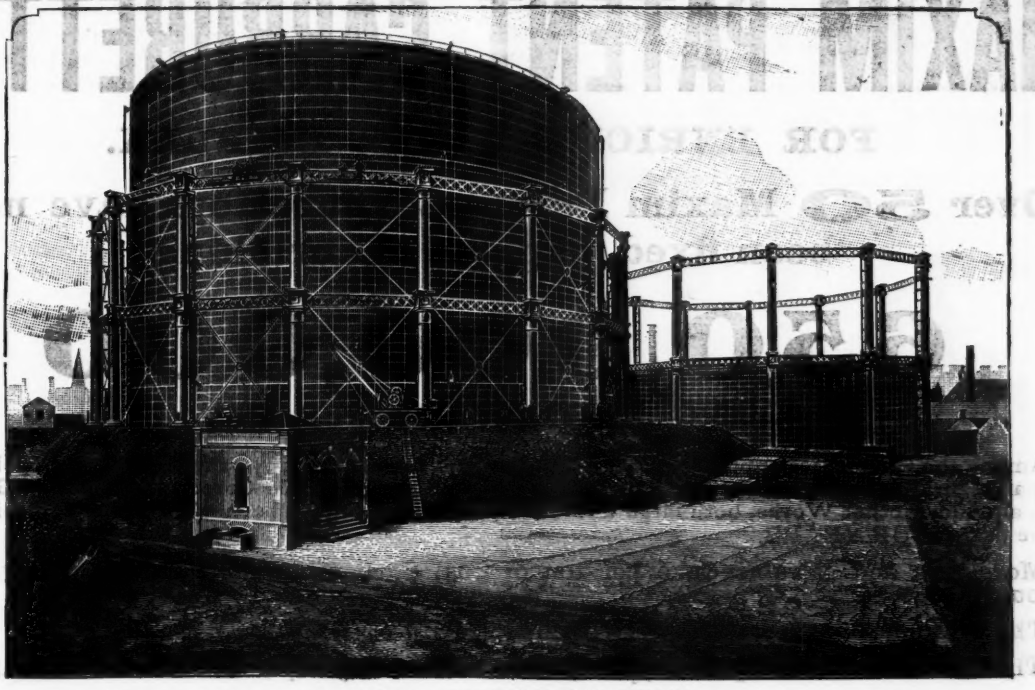

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TWO LIFTS added to existing Holder on the ROPE SYSTEM, thereby doubling the Capacity.

NOTE—The Third Lift being controlled by Ropes as well as by the Columns, absolutely level working is assured.

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THAT IS

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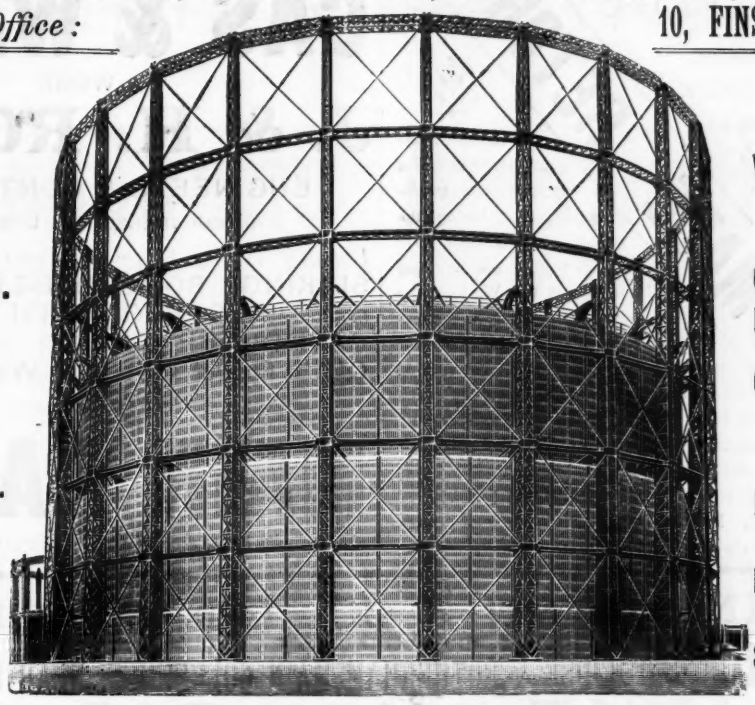

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WASHER-SCRUBBERS.

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CENTRE & FOUR-WAY VALVES.

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RETORT-MOUTHPIECES.

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ORME'S PATENT COIN PREPAYMENT METERS.

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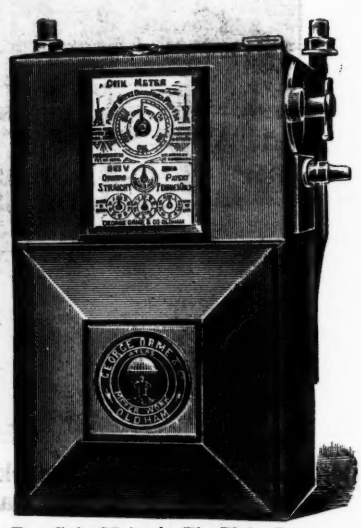

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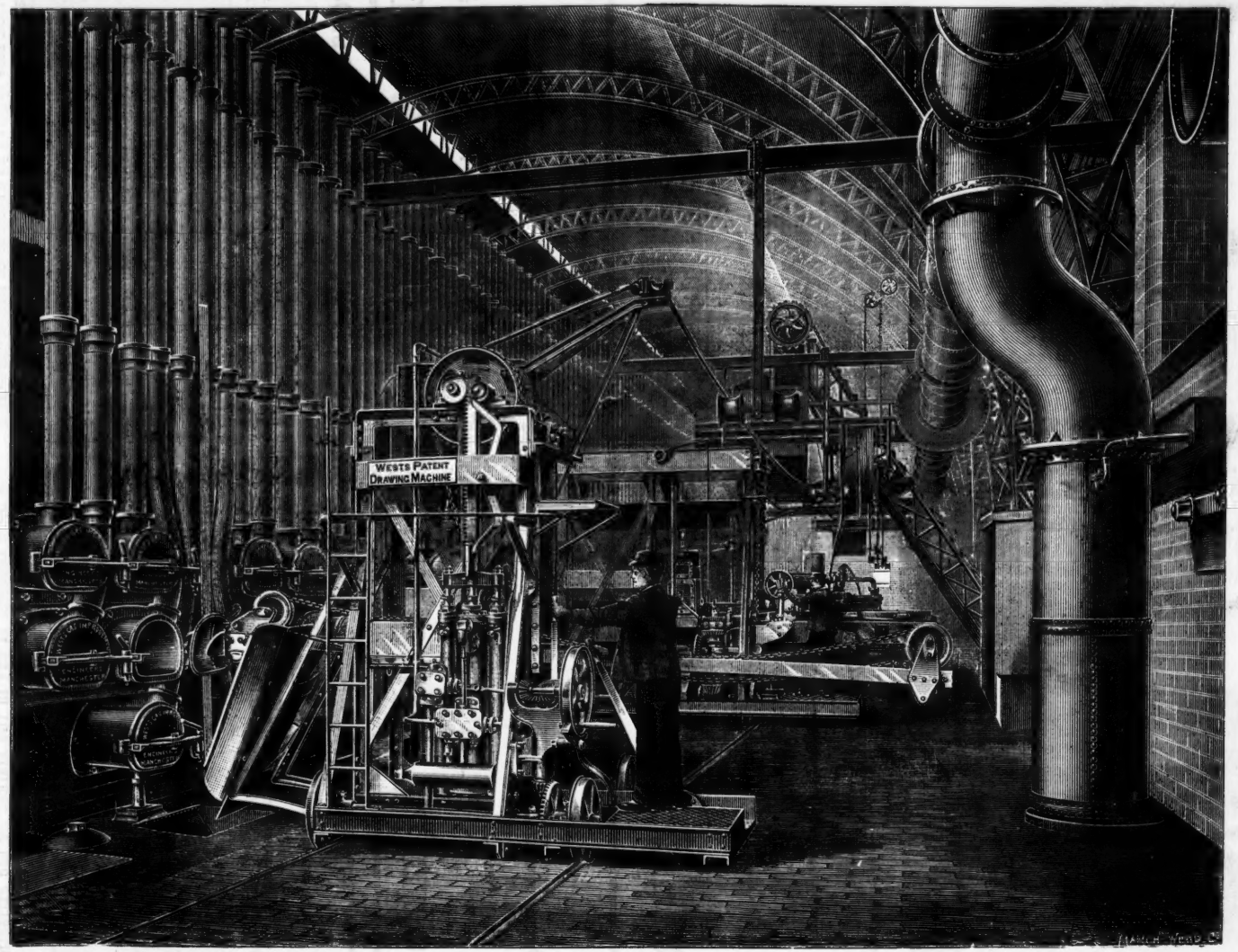

Interior of Retort-House at the Bradford Road Gas-Works, Manchester, showing the Compressed-Air Drawing and Charging Machines.

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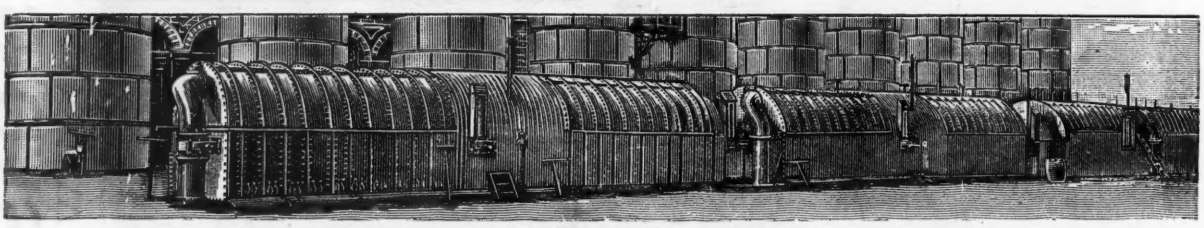
PATENT "STANDARD" WASHER-SCRUBBER

☛ **484** of these Machines (capable of dealing with **464,490,000** cubic feet of Gas daily) in use which fact is given as evidence of this apparatus being the Most Efficient of any in the Market for the extraction of Ammonia, Carbonic Acid, and Sulphuretted Hydrogen from Coal Gas.



View of SIX PATENT "STANDARD" WASHER-SCRUBBERS, erected at the Beckton Station of The Gaslight and Coke Company (the Engines driving same being under Galvanized Iron Covers). This Company have 30 of these Machines in use. They are also in operation at a great number of Gas and other Works in this Country and Abroad.

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ALL SIZES.

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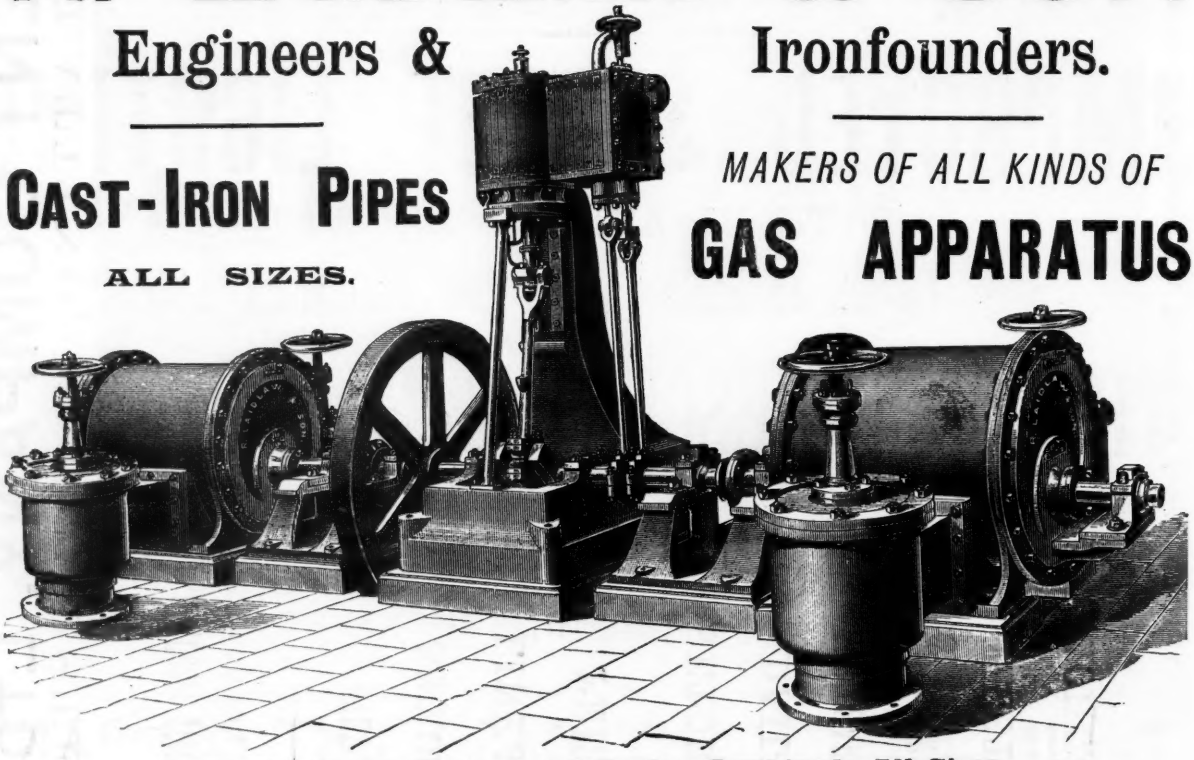

Beale's Gas Exhausters and Engine Combined—All Sizes.

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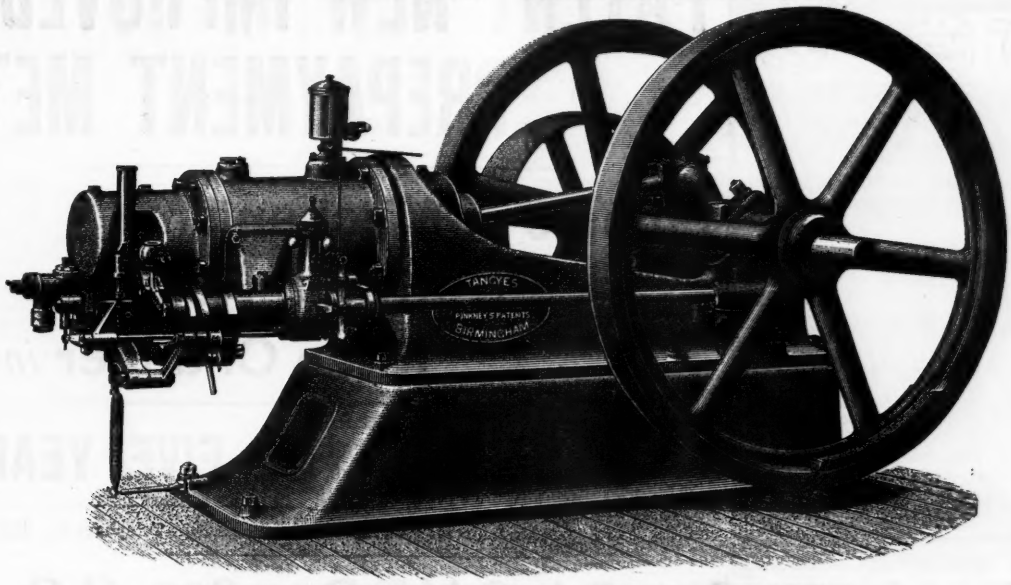
"OTTO" PRINCIPLE. PINKNEY'S PATENTS.



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ENGINES OF ALL SIZES.

TANGYES LIMITED, BIRMINGHAM;

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IMPROVED STREET LIGHTING

WITHOUT ADDITIONAL COST,

With THREE to FOUR TIMES the ORDINARY LIGHT,

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THE INCANDESCENT GAS-LIGHT (Welsbach System)

The Inspector of Lighting in Glasgow reports that THE ANNUAL COST OF GAS FOR TEN INCANDESCENT GAS-LAMPS WAS £17, as against £39 with the old system, while obtaining FOUR TIMES THE AMOUNT OF LIGHT. The experiment lasted from May to November, during which time ONLY FOUR MANTLES WERE USED FOR TEN LAMPS.

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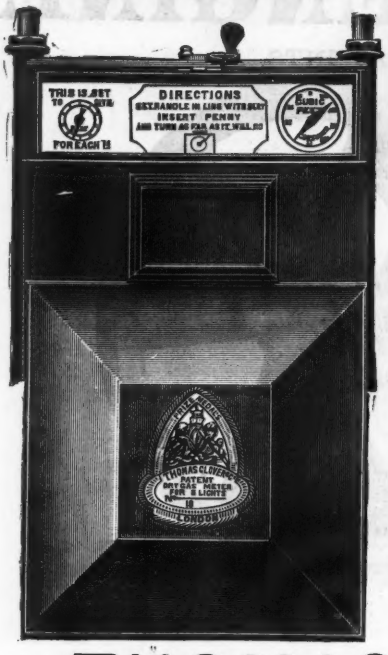

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Simple in Mechanism.

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Price Changer *in Situ.*

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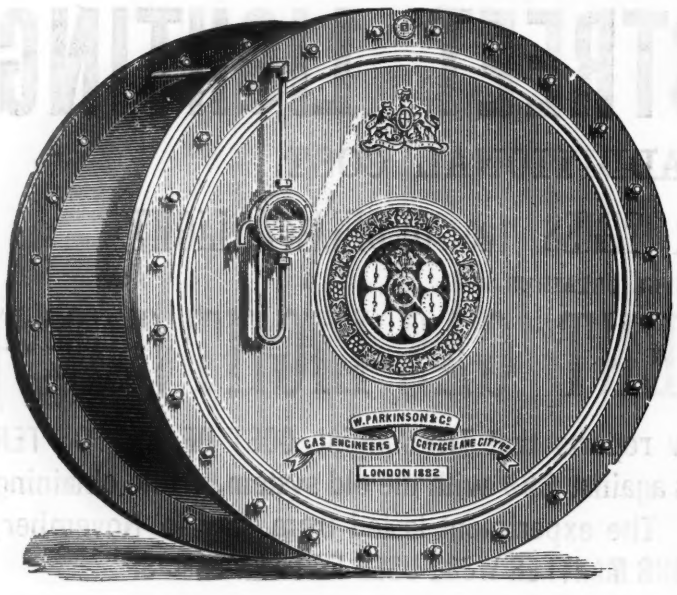

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Subscribers who desire to avail themselves of the reduction in the Subscription by paying in advance for the Year 1895, are reminded that this can only be done during JANUARY. The Subscription is 21s. in advance; 25s. if credit is taken.

EDITORIAL NOTES.

The Chartered Dividend—Abolition of Meter-Rent.

THE announcement has been made by the Directors of The Gaslight and Coke Company that the net profit of the working of the undertaking for the last half year enables them to recommend the payment of a dividend at the rate of 12 per cent. per annum on the ordinary "A" stock of the Company; carrying forward a balance of £255,254. The same rate of dividend was paid a year ago, when the sum of £62,124 was carried forward. The balance for the summer half of the past year was £239,971. It is also announced that, as from the commencement of the current quarter, meter-rents will be abolished throughout the whole of the Company's district. This is tantamount to a reduction of about a halfpenny per 1000 cubic feet in the Company's area outside the City; and it will remove one of the grievances which have recently been complained of by certain northern Metropolitan Vestries and other gas consumers. The financial position shown by the dividend announcement is undeniably strong, and will enable the Company to enter with the greatest confidence on a period of reduced selling price. The decision to abolish the inequality with regard to the meter-renting in different sections of the Company's district is something for which the proprietors and the public could hardly have been prepared by the remarks of the Governor (Colonel Makins) on the subject in his address to the last general meeting. He said on that occasion: "When their neighbours the "South Metropolitan and the Commercial Gas Companies "saw their way to abolishing meter-rents, they were themselves prepared to abolish them. Meter-rents at present "brought the Company an income of £58,000 a year; "and to give this up would entail on them a loss of "revenue of about 3s. per cent. But he had no doubt "that it was a good policy to adopt. There was special "reason in the case of their Company why they should "adopt it; because in the City they did not charge, and "never had charged, meter-rent. He did not know what "their neighbours might do; but, as he had said, if they "would abolish meter-rents, The Gaslight and Coke "Company would do so. But they could not do so unless "their neighbours did, because in that case they would "put themselves at a still greater disadvantage than they "already occupied as regards difference of charges." And, again, after twitting Mr. Livesey with maintaining meter-rents, which he had characterized before a Parliamentary Committee as "a very obnoxious and objectionable "charge," the Governor repeated the statement that the Chartered Company "were now prepared to get "rid of them, though if the other Companies did not "support this *it could not be done*." The italics are ours. Now it transpires that what could not be done in June is quite possible in January; for, although neither of the other Companies, whose support was described by the Governor as indispensable for the carrying out of the project of abolishing meter-rents, have moved in the matter—the South Metropolitan Chairman, indeed, defended and justified the charge at the following meeting of his Company—Chartered meter-rents are to go.

It is perhaps not a very great matter; certainly it is nothing to throw stones about. Meters have to be paid for in one way or another, either directly or indirectly. This is the central fact of the question. Meter-rent is a charge which consumers sometimes complain of, it is true. But then they not infrequently also grumble at the price of gas; and it is positively certain that, where a sufficient charge is not specially made to cover the cost of measurement of the gas supply, this must be borne out of the general revenue of the undertaking. Consumers sometimes allege that meter-rents are excessive; that they press unequally upon different consumers; and that an unfair profit is generally made out of such charges, because the suppliers of gas never give consumers the benefit of any better terms they may be able to come to with the meter makers. The last count of the indictment is very like one of the grievances which gas companies themselves have against the meter trade. When no meter-rent is specifically charged, some of these complaints disappear; but it would be a mistake to suppose from this that all inequality of charge for measurement of the gas is thereby removed. In point of fact, it not only remains, but is in certain cases aggravated. Take the instance of a large consumer who has a fancy for the electric light. He

has a large and expensive meter which he prefers to keep because he needs gas as a stand-by. So long as the meter is his own, or he is willing to pay rent for it, this prudential policy of his harms nobody. Cease to charge meter-rents, however, and the undertaking as a whole is burdened by the expense of the meters retained for the least desirable kind of business connection, which most gas companies would rather cut adrift altogether.

It is not necessary, however, to discuss all the *pros* and *cons* of meter-renting upon the present announcement of the Directors of The Gaslight and Coke Company. As they have the money to spare, they are perfectly competent to give their consumers the benefit of it in one way as another. What impression will be created by the announcement, in the circumstances, is another question. We fear it will fail to satisfy the Rowlands party of agitators, who will be more likely to regard the concession as one more proof of the squeezability of the Directors. They clamorously demanded the abolition of the charge; and if they now exult in the Directors' action as having been due to their efforts, and point to the apparent saving to the consumers of nearly £60,000 a year as a piece of justification for their organization, we do not see what answer can be made to them. It is even more awkward that the incident should be quotable as a proof that no reliance can be placed in the governorial *non possumus*. It may be permissible in political life for an administration to calmly undertake, after but a short interval devoted to further reflection, to follow a course of action which a leader of the party has proclaimed impossible; but one does not expect this kind of thing in business. Colonel Makins's declarations upon this head six months ago were far too categorical to leave him at liberty to falsify them at will. If the Directors of the other London Gas Companies were to reproach the Chartered Board with insincerity, the accusation would go home. But it is not very likely that they will waste expostulations with gas administrators who appear to have their own standard of consistency, commercial ability, and neighbourliness.

Professor Lewes on Commercial Acetylene.

The event of the past week for the gas industry was the introduction of commercial acetylene as a carburetting material by Professor Vivian B. Lewes, in a Society of Arts paper, read before an intensely interested and appreciative audience on Wednesday evening. Whatever may be the future of this novelty, its appearance in working dress is something to note in these columns. We report the paper and the discussion, and comment upon the subject at length, elsewhere; so that it is unnecessary to say much about it here. That omnipresent personage, the "practical man," will, of course, have a good many questions to ask concerning acetylene as an enricher of gas—such as whether the estimate of its cost is correct, what it is capable of effecting for a particular make of common coal gas, whether it is safe to handle, and what not. Time will reveal the truth in regard to these and all the other practical points that suggest themselves. For the present, the only correct attitude to be taken with respect to Professor Lewes's paper and the subject dealt with therein is that of high and warm appreciation. Nobody can see to the end of the applications of commercial acetylene; but it must be freely conceded to have made its bow in England in admirable style under the skilful chaperonage of unimpeachable scientific authority. Acetylene, if—or rather we should say when—it becomes an article of commerce, may be expected to interest a far wider circle than that of the followers of the gas industry. There is a great fascination about the remarkable substance, carbide of calcium, from which it is produced in a state of almost perfect purity by the simple addition of water. First prepared as one of the innumerable products of experimental chemistry which, according to the witty American doctor, "are not good for anything, and smell abominably," it has awaited its time to be born again in the fiery matrix of the electrical furnace, and now bids fair to find a place among the accessories of modern industrial life. Such is the way of man's gropings into the secrets laid up for him in the mighty scheme of things which we call our world. First the toy, then the tool. First the seeming aimless curiosity of the searcher, then the organized labour of the technician, and the directing, economizing control of the man of business. And the result is always the same; that is to say, when the ways and means have been rightly chosen and used, there is a more or less perceptible addition to the "unearned increment" of comfort and cheapness experienced by the community, hardly anybody knows how or why.

The Trade Union Deputation to Mr. Asquith.

The Trade Union leaders had a capital advertisement in last Thursday's newspapers, which published long reports of the doings of the deputation that waited the day before on Mr. Asquith, to lay before him certain matters embodied in the resolutions passed at the Norwich Congress. One after another the professionals in question, beginning with Mr. Woods, M.P., and including Mr. J. Burns, M.P., Mr. J. H. Wilson, M.P., and Mr. Pete Curran, of the Gas Workers' and General Labourers' Union, treated Mr. Asquith to a carefully selected assortment of the conclusions promulgated at Norwich as the deliberate judgments of the organized workpeople of this country; and the heroic Home Secretary bore the infliction without flinching. One speaker wanted the Government to pay the workmen in the national employ "a living wage," and to increase the number of civil servants "drawn princi-" pally from the ranks of the working men themselves." Another urged the reintroduction of the Employers' Liability Bill of last session, but with no permission for contracting out. Mr. John Burns, being a Member of Parliament, wanted to throw all electoral expenses upon the rates; and he demanded that "the payment "of members should be pressed forward." Mr. J. H. Wilson, as an individual to whom the palladium of British liberty has not been kind, wished the Government to create a new occupation for the unemployed working man—that of professional juryman at "adequate" wages. Special juries, he thought, are a privilege of the rich, and should be abolished. Mr. Pete Curran wanted an amendment of the law of conspiracy, apparently in order that Trade Unions may do with impunity what is forbidden upon their peril to unorganized citizens. Another ardent reformer mixed up the compulsory half-yearly inspection of steam-boilers, the abolition of the veto of the House of Lords, and the suppression of "obstruction" in the Commons as the composite mandate which he was charged to deliver on behalf of his constituents. And they all talked as if Mr. Asquith did not know all about them and their little schemes; and he, for his part, played the game as solemnly as the gravity of the occasion demanded. When he came to reply to the observations of the deputation, however, he lost no time in showing that the proceedings of the Norwich Congress were well known to him, as they must be to every newspaper reader; and he praised the engineers of the demonstration for their good judgment in saying nothing to him about the more outrageous resolutions of the congress, which he should have been constrained to condemn. As it was, Mr. Asquith managed very cleverly to denounce those resolutions of the congress which were rendered conspicuous by their absence from the selection offered to his notice by the deputation. Moreover, he contrived to bring into the light a besetting weakness of the class of working man he saw before him—the man who wants to do anything rather than work at his trade, if he has one, and is always on the hunt for a snug berth under Government, with a pension. Mr. Asquith declares that he has largely added to the staff of inspectors in Government pay (the agitator loves to "inspect" other men working—for a consideration), and has thousands of applicants for every vacancy. And so, having given the members of the deputation quite as much "straight talk" as they could stand, the Home Secretary sent them—not exactly about their business, but to take up again the far more interesting and congenial task of minding the business of others, which is the source of the agitator's livelihood.

Moderation in Municipal Politics.

Having mentioned several times the notions entertained or professed by the "Progressive" party in the London County Council with regard to the gas supply of the Metropolis, it is right that we should place upon record what the opposite, or "Moderate," party has to say upon the same subject. There will be a new County Council in March; and, in view of the election, both parties are looking up their candidates, and equipping them with principles, or whatever answers the same purpose as an attraction for votes. Lord George Hamilton, the

"Moderate" Chairman of the London School Board, is a leader of the party who has spoken upon the issues that will be raised in March; and he declares himself "not in "the least opposed to the municipal body or central "authority taking possession of the gas and water under-"takings, provided it is done on fair terms." This is perfectly right and proper. The moment he understood what the transfer value of the London gas undertakings is likely to be, no prudent municipal politician would care to assume, in the name of the ratepayers, the responsibility of managing a business which presented so slender a prospect of repayment for the trouble and the commercial risk, to say nothing about any financial risk. But the ardent philanthropists of the Progressive party on the County Council think it would be very nice to have the gas and water works, because they could then employ so many more men, and thus help to reduce the number of the unemployed. Lord George Hamilton thinks, on the contrary, that "it is fallacious to declare that the acqui-"sition of these things will increase employment; it will "tend to diminish it." The transfer of the gas supply to the County Council or to a new London Municipality would at least help to place a few gas testers among the unemployed; but this could hardly have been Lord George Hamilton's meaning. In England, at any rate, the question of whether gas-works are in the hands of a municipality or of a company cannot usually be answered by a count of the number of employees. This would be to copy the Philadelphia system; and we are hardly come to that yet. The Moderate view appears to be that a municipal authority should not undertake any commercial business—in which category gas supply would naturally fall to be included—that can be done as well, if not better, by private enterprise. This is no other than the policy that has been advocated in these columns since a period long anterior to the era when local politicians first took to calling themselves Progressives and Moderates. It will not make very much, if any, difference to the Metropolitan gas interest if one or the other party in the London County Council gets the upper hand at the next election. The Companies have the law to guide them, and they will follow it; and the Council have their part of the law to administer, which they will doubtless continue to do as usual. So far as their attitude towards the Gas Companies is in question, there has not been much to choose between the County Council and their predecessors, the Metropolitan Board of Works. The newer body have been stiffer in their interpretation of their duty in the matter of prosecutions for deficiencies of illuminating power; but, on the whole, they have not been difficult to get on with.

The Methods of the New Trade Unionism Reviewed.

THE current number of the *Quarterly Review* contains an outspoken article entitled "The Methods of the New "Trade Unionism," which should be studied by all interested in contemporary industrial developments. We cannot pretend to do more in this place than call our readers' attention to this important contribution to the clearing up of a complex and many-sided subject, the public discussion of which has happily outlived the era when brickbats were resorted to by one party to the argument. The reviewer bases his criticism upon five works bearing upon the general question that have appeared at different dates from 1888, of which two were published in Paris, one in London, one in Glasgow, and the last in West Hartlepool. It cannot be complained, therefore, that the present critic of the working of New Unionism has constructed his theses upon an insufficient foundation. When opportunity serves, it will be our pleasure as well as our duty to treat the reviewer's work with the fulness of examination merited by its great importance. Suffice it for the present to state that the essay is written with calmness and candour; and the writer exposes the sins and blunders of the ignorant leaders of aggressive labour combinations "more in sorrow than in anger." He does not say anything of legislation; and he admits that there is nothing to be said. His general conclusion is that "the law can try to keep the peace, but it is "powerless to heal the mind diseased, by revealing to it a "vision of the better way. That is the supreme need of the "hour. This realized, men will no longer waste themselves "in forced marches after the *ignis fatuus* of an impracticable "Collectivism, or seek to exchange the civilized instincts of "mutual concession for the primitive and savage instincts "of coercion." While admitting that the theory that the Trade Unionist leaders are all self-seeking knaves is "unfortunately quite untrue"—the phrase will not pass without question, and probably misinterpretation—the reviewer maintains that the honest, misguided fanatic who is most to be feared in this particular connection is intellectually in his childhood. Some very unpleasant records are reproduced against such men as John Burns and J. H. Wilson; and the inconsistency of the Socialist journalists and politicians who, while prating of the equality of man, refuse to have their emoluments cut down to the average wages of their dupes, is piteously exhibited. Altogether, the essay is a strong one. The material of which it is composed might fill much more space than the score of *Quarterly* pages occupied by it; but such as it is, we should like to see it in the possession of a far wider circle than the select and cultured patrons of our best critical periodical.

Messrs. W. and B. Cowan have registered their business as a Limited Company, under the Companies' Acts, 1862 to 1890. We are informed that the whole of the capital has been taken up by the present partners in the firm and the signatories to the Articles of Association.

Sugg's Gas Engineer's Pocket Almanack and Lighting Table for 1895.—We have received from Messrs. W. Sugg and Co., Limited, a copy of their pocket-book for gas engineers, which contains the collection of useful tables to which we have referred when noticing previous issues.

Abolition of Meter-Rents by The Gaslight and Coke Company.—We learn from the Secretary and General Manager of The Gaslight and Coke Company (Mr. J. W. Field) that the Directors have decided to abolish meter-rents throughout the Company's district as from the 1st inst. He also informs us that the balance to the credit of the net revenue account will (subject to audit) enable them to recommend the payment of a dividend for the past half year at the rate of 12 per cent. per annum; carrying forward a balance of £255,254 11s. 3d.

The Secretaryship of the Imperial Continental Gas Association.—At their meeting last Wednesday, the Directors of the Imperial Continental Gas Association appointed Mr. G. F. Thompson as the successor of Mr. R. S. Gardiner, whose resignation of the secretaryship was announced in the JOURNAL for Nov. 20 last. The great responsibility and varied duties attaching to this post require, as may be well understood, extensive and special experience; and this Mr. Thompson will bring to bear on his work—he having been a member of the London staff for upwards of thirty years, during fifteen of which he has been Mr. Gardiner's chief assistant. Consequently, he is well known to all who are officially connected with the Association, as well as to a large number of the proprietors, who are certain to regard the appointment with approbation. Mr. R. W. Wilson (who has been in the service 23 years) has been promoted to the position of Assistant-Secretary.

The Severe Gale in the Past Month.—In the JOURNAL for the 1st inst. (p. 17), we gave some particulars, supplied by Mr. W. Chew, of Blackpool, as to the effect, in his district, of the exceptionally severe gale which occurred on the 22nd ult. According to a paper read by Mr. C. Harding at the meeting of the Royal Meteorological Society last Wednesday evening, the part of the coast in question felt the heaviest force of the gale. At Fleetwood, the hourly velocity of the wind reached 107 miles between 8.30 and 9 30 on the above-named day; while for four consecutive hours, its velocity in the same part of the kingdom exceeded 100 miles. Mr. Harding remarked that this was the greatest force of wind that had ever been recorded in the British Isles, and was ten miles an hour in excess of the highest wind velocity in the great storm of Nov. 16-20, 1893. At Holyhead, during certain squalls, the wind attained a force equal to an hourly velocity of 150 miles between ten and twelve o'clock on the morning of the 22nd ult.; the strongest force being mostly from the north-west.

Resignation of the Gas Manager at Plymouth.—It will be remembered that, in the description of the new works of the Plymouth and Stonehouse Gas Company which appeared in the JOURNAL recently, it was stated that the new retort-house was fitted with West's stoking machinery and regenerative furnaces. The Directors of the Company decided to place the working of this plant—which is now making nearly all the gas consumed in Plymouth—under the sole control and direction of Mr. West; and, as the result, Mr. H. Townsend, the Company's Engineer and Manager, has tendered his resignation, which has been accepted. Mr. Townsend has occupied for nearly five years the position which he is about to relinquish. This period has been one of the most trying ever known by the gas industry; and it is to the credit of Mr. Townsend's management of the works that the Plymouth Gas Company have been able to come through it without either increasing the price of gas (which, at 1s. 9d. per 1000 cubic feet, is the lowest in the kingdom) or touching the reserve fund. Few gas undertakings have been similarly fortunate.

WATER AND SANITARY AFFAIRS.

As the time approaches for the third occasion on which the London County Council will have to undergo election, the note of party warfare sounds louder and clearer. The first election was a mild affair; the second was a struggle; but the third will be a fight, earnest and vigorous to the verge of fierceness. For once, London is "waking up" to some appreciation of its local interests. The report of the Royal Commission on the Unification of the Metropolis produces a crisis in the history of London Government; and nothing seems wanting to rouse the energies of the several parties interested in the question. "Programmes" are going forth, dealing with the leading problems involved in Metropolitan affairs; and, among the rest, water supply receives some attention. This topic derives additional zest from the presence of the eight "Transfer" Bills which the London County Council propose to bring before Parliament in the coming session. It somehow happens that both the great political parties have declared their adhesion to the principle that the London Water Supply should be "brought under the control of the London "County Council." Such is the exact language of the circular issued by the Committee of the Metropolitan Union of Conservative Associations. That this policy should characterize the "Progressives" and their allies is, of course, inevitable. The Conservatives, who may be taken as identified generally with the "Moderates," though not entirely so, say that they are "in favour of an "arrangement, on equitable terms," in order to effect the contemplated "control" by the County Council. However, an "arrangement" is not necessarily a transfer; and "control" may not demand absolute possession. But it is going farther than need be to say that "the County "Council" are to exercise the proposed control. Perhaps the Conservatives expect to capture Spring Gardens in the coming contest, in which case they see no objection to the water supply being ruled from that quarter. The contingency is a possible one; and such a result would be free from the many and serious objections, financial and otherwise, which apply to Progressive administration.

In making these and other remarks of a like nature, it will be understood that we have no political bias. The JOURNAL has nothing to do with politics, except so far as politics touch the water supply, or some cognate interest. But we cannot let Conservatives and Radicals, or Moderates and Progressives, handle this subject without something being said on our part in respect to the real merits of the question. The views of the Moderate party with regard to the water supply have been expressed by Lord George Hamilton, the Chairman of the Council of the London Municipal Society, when interviewed by a representative of the *Pall Mall Gazette*. The declarations made by his Lordship are, in some respects, more guarded than those of the Conservative manifesto itself. Lord George is content to say: "I am not in the least opposed to the "municipal body, or central authority, taking possession "of the gas and water undertaking, provided it is done on "fair terms." This is standing rather on neutral ground. His Lordship showed his comprehension of the subject, by remarking that the rapid extension of London must be taken into consideration in the matter of the water supply, "because the case of the people outside will be "quite as important as that of those inside"—speaking of the area that is at present under the administration of the County Council.

Whatever may be the strength of the movement in favour of transferring the Metropolitan Water Supply to a public authority, it does not follow that this flow of the tide will carry the scheme of the London County Council safely over the rocks. We venture to predict that the eight Transfer Bills of the Council will not receive the authority of Parliament. Should they pass the Commons, they will be wrecked in the Lords. There is also the chance that the constitution of the Council will undergo a change at the March election, and that a new policy will be adopted concerning the water supply, involving the abandonment of the present Bills. The substitution of a Conservative for a Liberal Government is another breaker ahead. But, above all, we look to Parliament, even in its present form, as having too much respect for the rights of property to give statutory effect to such an inequitable scheme as that by which the County Council propose to lay hands on the undertakings of the London Water Companies. Mr. Fardell, himself a member of the Council, writes to *The Times* at considerable length, objecting to many of the proceedings of the body with which he is so identified. Among other things, he says: "Their Bills for "the acquisition of the Water Companies propose to deal "with acquired rights in a manner hitherto unknown." "In short," he observes, concerning the Council, "the "whole programme of the future is one of interference and "acquisitiveness." We notice further that *The Times* is becoming more distinctly conscious of the danger now undergoing development Using more vigorous language than that employed by Mr. Fardell, it says: "The grasp-"ing ambition of the County Council, which has been "captured by Radical politicians, but is really dominated "by the Socialistic ideas of the Fabian Society, grows "by what it feeds on." Accepting the Conservative programme as that of the Moderates—which is not quite the case—*The Times* complains that "a very uncertain "sound is uttered in the programme of the Moderate "party" in regard to many of the Progressive proposals. These proposals are described as "accepted "in principle, but subject to conditions which are "left somewhat too vague." The water supply is to be acquired; but "on equitable terms," like the tramways, which are to be obtained on terms which shall be "fair "and just." *The Times* inquires: "But how are these "phrases to be interpreted?" It had been well if the Conservative programme had embodied the idea expressed in one of the meetings of the County Council some time ago by Sir John Lubbock, that the Water Companies were likely to manage the supply better than a public authority. The experience gained under the Works Committee gives great force to such a conclusion. It would have been a happy thing for all parties if the Transfer Bills had broken down yesterday under the Standing Orders; but we hardly expected this, though very weighty reasons tending to such a result were given in the memorials from the Water Companies and the debenture-holders. Unfortunately for the ratepayers, there is one "bill" which cannot be thrown over. It is that of "costs," as exemplified in the case of the southern approach to the Tower Bridge, concerning which Sir John Lubbock has framed such a crushing indictment against the Council. The Water Bills are of the same nature.

American and Scotch Oil Companies.—It is reported that the Scotch oil companies have, as the result of a joint meeting in Glasgow with Mr. Bedford, of the Standard Oil Company in America, come to an agreement whereby the arrangement made two years and a half ago will be renewed. Solid paraffin is to be increased ¼d. per pound, which will advance the revenue of the Scotch oil companies by £50,000 annually. The competition with American petroleum is also to come to an end.

The Opposition to the London County Council's Water Bills.—Last Friday, Mr. Campion, one of the Examiners of Petitions for Private Bills, had before him the memorial of the debenture-holders of the Chelsea Water Company, complaining of non-compliance with Standing Orders in the case of the petition for the Bill promoted by the London County Council to acquire their undertaking. Similar memorials had been presented in regard to the other Water Bills of the Council. The points raised by Mr. Rees on behalf of the memorialists referred specially to clauses 4 and 12 of the Bill (dealing with the transfer of the undertaking by agreement and the debenture stock); and he contended generally that the notice given for the Bill did not cover its objects. The first-named clause proposes that the Company and the Council may agree for the sale and transfer of the undertaking, or any part of it, subject to any debenture stock charged thereon, for such consideration, and on such terms and conditions, as may be agreed upon between them. This, Mr. Rees said, provided for a qualified sale of the undertaking; whereas in the case of an ordinary Bill the undertaking was sold as a whole. As to clause 12, it permitted a compulsory dealing with the debenture-holders, for which, except in one very special case, there was no precedent, and which therefore violated parliamentary rule. Mr. Cripps, on behalf of the promoters, maintained that all that was required by the Standing Orders was a general notice such as had been given in this instance; and he justified his argument that it was adequate by quoting decisions which he said had been given in cases of a very similar character where points such as these had been raised. He had not concluded when the Examiner rose. The inquiry was therefore adjourned till yesterday, when Mr. Cripps continued his argument. Mr. Rees having replied, the Examiner decided that the notice given was sufficient to put the debenture-holders on their guard, and to induce them to look at the Bill to see how their interests were affected. He accordingly declined to sustain the allegation of the memorialists. We shall report the matter more fully next week.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 184.)

THE general tone of the markets in the Stock Exchange during the past week was a great deal brighter and more cheerful. Buyers came in freely; and one or two incidents tended to animate them. Several important railway dividends were announced at better figures than had been expected, which, coupled with other indications of reviving trade, produced an excellent effect. Taken all round, quotations showed a good advance at the close, notwithstanding some profit-snapping. The choicest securities are still going up; and, on Saturday, Consols changed hands at the colossal price of 105. The Money Market remains in its old condition of extreme ease. Business in Gas stocks would have been extremely quiet and limited, but for the very important exception of Gaslight "A," in which transactions were more than usually numerous. The quotation was at once deposed from the giddy height it had been raised to at the close of the preceding week; and by mid-week, the price was no better than 261. It rallied, however, a point or two, and closed at about 263. The Directors announce the same dividend as last year—12 per cent.; and they appear to have earned it, and, in addition, to have increased their undivided balance by some £15,000. Their decision to abolish meter-rents will doubtless provoke much comment. In the previous twelvemonth, meter-rents brought them in £58,500, which is equivalent to rather more than ¾d. per 1000 cubic feet of gas sold. To lower the price of gas by one penny, would not cost them above another £20,000, and would perhaps have been a more popular measure. However, there it is. South Metropolitans were very quiet, and devoid of feature; while Commercials were not touched at all. In Suburbans and Provincials, there were not more than three or four transactions all the week; but the tendency of choice stocks to improve in value was indicated by a further rise in Brentfords. The Continentals were quiet and steady. Few of the rest presented any feature; but of the South Americans, Buenos Ayres and Monte Video advanced. Chicago second bonds also improved. The Water Companies gave signs of more activity, and a very general disposition to increase in value; several quotations being materially higher.

The daily operations were: Gas was quiet on Monday; and prices in general were very firm all round, except in Gaslight "A," which fell 3. Tuesday's business was almost wholly in the latter stock, which remained steady. Chicago second bonds advanced 2; and Monte Video, ½. On Wednesday, there was very little business done in Gas; and nothing moved. But in Water there was a general advance. New River rose 3; East London, Kent, and West Middlesex, 2 each; Southwark ordinary, 1; and Grand Junction, ½. Thursday was much more active, especially for Gaslight "A." Brentford old rose 2. Friday was quieter; and no changes took place. Saturday's business was also unimportant; and quotations closed without further change.

ELECTRIC LIGHTING MEMORANDA.

Fresh Work for Central Stations—Street Transformer Stations Sanctioned—Queer Doings in Liverpool.

IN engineering matters, as in most other human concerns, it is the unexpected that happens; and when electric lighting engineers learn what Professor Lewes and others had to say on Wednesday night about their prospective interest in the manufacture of carbide of calcium, a good many of these anxious gentlemen may be expected to rub their eyes over it. The suggestion that a practicable way of levelling-up the daily load-line of a central station is to be found in using the dynamos—otherwise unemployed during the daytime—for working electrical furnaces charged with carbon and lime, to produce a substance for use in carburetting coal gas, has an air of irony about it which may not at first be pleasing to our electrical friends. Yet Professor Lewes, Dr. Anderson, and Mr. C. C. Carpenter gave utterance to the idea last week, at the Society of Arts; and, obviously, if there is anything to be done with carbide of calcium, it is as a bye-product of an electric lighting station that this material can be most advantageously made in this country. Dr. Anderson, whose words on such a subject carry weight, went so far as to speak of the preparation of carbide of calcium as fulfilling the *desideratum* of electrical storage; but this, of course, it would only do indirectly. The time may come when an electrical furnace for the manufacture of the enricher will be a necessary adjunct to a well-appointed gas-works; and then the dynamos might be employed during the evening hours in generating electric light as the residual, or secondary product. The ideas called up by this new departure in the lighting industry are indeed bewildering, and would start upon endless vaticinations some of the professional prophets connected with the electric lighting interests—unless these ingenious persons should be overcome by a sudden attack of modest reticence upon discovering how completely the new manufacture has taken all their previously issued predictions in rear, and converted electricity into a means of improving the gas industry. "So the whirligig of time brings about his revenges." The quotation is terribly hackneyed; but really "it touches the spot," as the advertisement has it, better than any brand-new moralizing that we could strike out on the spur of the moment.

The electric lighting companies of the Metropolis are to have their transformer chambers under the streets after all, provided these accommodation works are properly designed and constructed. Such is the gist of the communication on the subject addressed last week by the Board of Trade to the London County Council, the Wandsworth District Local Board of Works, and other Metropolitan Local Authorities who recently raised objections to the proposals of the electric lighting companies in this regard. The circumstance of some of the London Vestries having themselves adopted systems of electric lighting which require street transformer chambers may possibly have helped the Board of Trade to the decision that there is no valid general objection to such an arrangement, and that all the requirements needed to secure the public safety can be satisfied by the adoption of proper precautions. The electric lighting interest is to be congratulated upon having gained the point. We are not at all desirous of seeing the electricians hampered in their work by the insistence of the highway authorities on superfluous and pedantic restrictions ostensibly conceived in the interest of the public safety. At the same time, there must be no question as to the obligation of the electricians to respect the prior and continuing rights of other users of the subsoil of the public streets. Naturally enough, the electricians exhibit a desire to throw upon other people's shoulders the blame of all street troubles connected with their plant and performances; and this is not precisely the way to make friends of those who must perforce be their neighbours. The gas companies bear them no malice, however, and are not even disposed to resent the petulant complainings of those who are without their experience in highway business; so there is not likely to be unnecessary protesting on the part of the gas interests in regard to placing street transformer chambers, but every instance will be dealt with strictly on its merits.

There appear to be peculiar doings in Liverpool in regard to the action of the Corporation (already commented upon in these columns) in the matter of the proposed acquisition of the local electric lighting company's undertaking. When Alderman Smith brought before the City Council the proposal to buy up the undertaking as a going concern, without waiting for the statutory opportunity for such a proceeding, Mr. Alderman Forwood ventured to remind the Council that the Corporation have it in their power to apply to the Board of Trade for permission to start an undertaking of the same kind of their own, if they were really desirous of going into the electric lighting business. It was not that Alderman Forwood wanted the Corporation to take this step. He merely adduced the possibility of it as a reason why the Corporation should not be in a hurry to tax the ratepayers of the city for the purchase of the Company's interest, which has been the creation of precisely the same statutory facility as the Corporation are at liberty to fall back upon. Naturally, as a man of business, Alderman Forwood saw that the moment the Company perceived that the Corporation coveted their property, they would stiffen their price. His suggestion was scouted by Alderman Smith, with a good deal of superfluous scorn, as dishonest; and the party of purchase demanded, and obtained from the Council, a "blank cheque" to fill in with such reasonable figure as they doubtless had in mind as representing the then value of the Company's property, undepreciated by threat of Corporation competition. Something occurred during the ensuing few days, however, to cause Alderman Forwood to smile and his opponent to frown. People began to buy the Company's shares for a rise; and the rise duly came upon the imminent prospect of purchase by the Corporation. What was Alderman Smith to do? Unwilling to hand back the blank cheque to the Council, with a frank confession that the Stock Exchange had been too much for him, he has actually decided that the Corporation had better apply to the Board of Trade for those electric lighting powers which he objected to Alderman Forwood speaking of. For this tergiversation, Mr. Smith and his party in the Lighting Committee are soundly, but not excessively, rated in a local paper. It would have been a different thing had the Corporation started by applying for a Licence before showing their willingness to discuss terms with the Company; but now they cannot go to the Board of Trade with clean hands, according to Alderman Smith's own declaration. That he should be driven to take the course which he scorned when it was referred to by his colleague in the city government is not complimentary to him in any sense. The upshot of the whole business will probably be the dropping of the purchase scheme. But, meanwhile, the Corporation are made to figure before the citizens in anything but a creditable light. The ratepayers may well ask themselves whether a Corporation Committee which so bungles a commercial negotiation could be trusted to lay out the public money prudently in such a speculation as the supply of electric light.

GAS OF 240-CANDLE POWER—A "SENSATION."

THE time was Wednesday evening last; the place, the well-known lecture-theatre of the Society of Arts; the man, Professor Vivian B. Lewes; and the matter, commercial acetylene. From this combination resulted, then and there, a sensation which, unless appearances are utterly illusory, will echo and re-echo through the industrial world for a very long time to come. When the announcement was made in the JOURNAL for the 8th inst. that Professor Lewes would read a paper on the 16th on "The Commercial Synthesis of Illuminating Hydrocarbons," no indication was given of the particular turn which the communication would take; but that a high degree of interest and importance would be found to attach to Professor Lewes's matter was foreshadowed by the steps taken, with the co-operation of Sir H. Trueman Wood, the Secretary of the Society, to secure a fit audience for the occasion. In consequence of this effort, a goodly contingent of gas engineers and others interested in the gas industry put in an appearance at the Society's house last Wednesday evening; but it is not to be supposed that a single individual among this critical portion of the audience had the faintest expectation of what was coming, or entertained the slightest idea that he was about to assist at what will, in all probability, come to be regarded throughout the gas and the allied interests as an epoch-making demonstration. Professor Lewes's and the Society's secret was perfectly kept; and its disclosure at the proper time was therefore all the more astounding. For his design was no other than the first exhibition to the world of one of the most striking of the fruits of modern scientific discovery in the new territory of physico-chemistry, the product of that remarkable research of Mr. T. L. Willson—carbide of calcium—the nature and properties of which were, by a pure concidence, described in our last week's "Technical Record." The absorbing interest of this programme, and the brilliant manner in which it was carried out, are not likely to fade from the minds of those who had the good fortune to attend on this historic occasion.

What Professor Lewes said will be found reported in full in another column. Our present purpose is to draw attention to the text of the paper, and to supplement it with independent testimony as to the demonstrations by which the lecturer proved his statements. He commenced by laying out the ground for the structure he was about to raise, inviting the attention of his audience to the twin methods of chemical research, analysis and synthesis, to make it quite plain that he was not going to ask them to take from him anything arrived at by occult means, or needing to be hedged about by the devices of charlatancy. Only too often, in the history of so-called new discoveries in chemical industry, there is something kept back. The result, whatever it is, is stated to be attained by the employment of some "chemical," the nature of which is not disclosed. Of course, a man of reputation in science does not mix himself up in such schemes; but things of this kind occur often enough to point the observation we now offer regarding the transparency of Professor Lewes's exposition. And when the lecturer had, by easily-followed steps, arrived at the top of the first stage of his structure—the announcement that it was the synthesis of acetylene in bulk which it was his purpose to deal with—he was careful to show that there is nothing absolutely new about carbide of calcium, or the phenomenon of its giving off acetylene when wetted with water. He carefully told the story of the early experiments with this compound; and only "let himself go," in the capacity of the exhibitor of a new thing, when he came to deal with the production and uses of it on a commercial scale by the method of Mr. Willson.

And a very startling exhibition it was—as utterly fresh and convincing as good matter in the hands of a master in the art of science exposition could make it. Carbide of calcium, as known to science, was a chemical curiosity until Mr. Willson happened upon a way of preparing it in bulk in the course of his experiments upon the manufacture of calcium alloys by the agency of his electrical furnace. But this discovery put a new face upon the compound. When an article that has only existed in grains comes to be turned out by the ton, it is, to all intents and purposes, a new article. In this sense, carbide of calcium is very new indeed; and its industrial possibilities are newer still, inasmuch as only the most direct and obvious of these developments have as yet been so much as hinted at.

Take it that the material can be produced by the ton, and it is impossible to surmise what chemical industry will be able in the fulness of time to make of it. The product of fusing together, in an electrical furnace, such common materials as lime and carbon in any suitable form, was exhibited by Professor Lewes as a greenish-grey stone-like substance greatly resembling the commonest description of serpentine rock. When kept in the air, a light coating of lime soon forms on its surface. Upon handling it, a faint, unpleasant odour, suggestive of garlic, and also not altogether unlike the familiar reek that emanates from the ironwork of an old gas-purifier, manifests itself. To all appearance, it is a dull, inert stone, devoid of any other properties than those of common road metal, and not more likely to be credited by the casual observer with gas-yielding capabilities. Upon a piece of this material, Professor Lewes sprinkled a few drops of water from a wash-bottle, and put a lighted taper to it. The nascent gas—acetylene—immediately ignited with more than the brilliancy of the pitchy flame of highly-bituminous coal in an open fire, and continued to burn fitfully over the wetted surface until all the water was gone. Then came the display of the same gas evolved in a jar (standing upon the lecture-table) which contained pieces of the carbide in water, and stored in makeshift glass holders. It was a dramatic *dénouement* of Professor Lewes's little plot when he applied a light first to a single open flat-flame burner, and then to a group of five similar burners, and people saw for the first time, in a public place, the intensely brilliant, white, and solid-looking flame of burning pure acetylene.

It is indeed a flame to wonder at. Nothing like it ever before came within the ken of a gas manager, or dazzled the vision of a photometrist. There is something startling in the suggestion that gas of 240-candle power—calculated, in accordance with photometrical practice, upon the basis of a consumption of 5 cubic feet per hour—can be burnt by means of an open flat-flame burner. When the carbide of calcium first came into Professor Lewes's possession, this had not, in fact, been done; and, in order to get a flame of acetylene at all, the American handlers of the gas had fallen back upon the brutal device of diluting it with a certain proportion of air. This was to repeat the crude American way of rendering naphtha gas usable. But the dilution of acetylene with air is even more objectionable than is the same treatment in regard to naphtha gas, inasmuch as it is more easily converted into a violent explosive mixture. Professor Lewes, in succeeding in burning acetylene in the pure state in which it comes from the mixture of calcium carbide and water, has saved its prospects as an illuminant. He showed on Wednesday those wonderful acetylene gas-flames already mentioned, each produced by burning the gas as made in the simple way described, without any adventitious mechanical or chemical aid, after the rate of half a cubic foot per hour, and stated to yield a measured illuminating power of 25 candles. This could easily be credited. But what it is more difficult to convey in mere words, is the impression of steadfastness, whiteness, and, so to speak, solidity which the flames in question made on the observer. At a little distance, no non-luminous zone could be perceived; but, on a close inspection, a tiny speck of blue over the top of the burner was visible. No smoke or smell escaped from these flames, which, although exhibiting in their colour the evidence of intensely active combustion, were found to be much cooler than oil-gas or albo-carbon gas-flames of the same size. This is a most striking feature of free-burning acetylene. The incandescent electric lamps, of normal brilliancy, by which the lecture-theatre was lit were made to look as dull as "red-hot hair-pins" by the agressive acetylene, which itself, by virtue of the irradiation produced by its dazzling white flame, appeared to form balls of almost blinding light when viewed directly in face or sideways of the flame. The mantle of the incandescent gas-light is no whiter than, if it is so white as, the naked acelylene flame, which does not flicker or change colour; but, in the absence of means of making a direct comparison between the two lights, it is rash to say which would bear the palm for purity of tint.

It is not for us to say what may be done with this new servant of a community that ever clamours for more light; and gets it more easily and cheaply every day, Considerations of the cost at which the carbide of calcium will be producible, and of the prospects of its utilization as a means of generating portable gas-light or as an enricher of common coal gas, suggest themselves to everyone who sees or hears of the substance and its qualities. But it is premature to discuss such questions at present; all that need be said upon these points for the time-being was said on Wednesday by Professor Lewes, and by those who took part in the extremely cogent little discussion that followed his brilliant discourse. When the time is ripe for more, it will doubtless be forthcoming. Meanwhile, it is only doing justice to all the parties concerned in last Wednesday's memorable proceedings in the Adelphi to acknowledge the high interest of the whole subject, and the adequate manner in which it was presented to the general and technical public. The discoverer of the system is to be congratulated upon the promise of the new industrial development; Professor Lewes may be complimented upon the deft and convincing way in which he performed the part of introducer of the novelty; and—if last, not least—the Society of Arts deserve to be credited with having proved once more the practical value of the agency wielded by the Council and the Secretary of this useful institution, for giving publicity readily and promptly to warrantable novelties in science and the industrial arts.

Messrs. Richmond and Co., Limited, of Warrington, have sent for our inspection a handy patent cock, designed to facilitate the turning down of gas-fires. It is a bye-pass arrangement with a direct main gas-way and stop-cock, and a subsidiary passage and cock working in semi-connection with it. When the main cock is opened, it opens the bye-pass by the same movement, by a simple cam-action; but when this cock is turned off, the bye-pass remains open and has to be closed by an independent movement. It will be a handy attachment for doctors' consulting-rooms, &c., where the full fire is only occasionally needed, and where a busy man would prefer to keep the gas burning at a small rate of combustion, ready for instant turning up, than have the trouble of re-lighting.

NOTES.

Sulphate of Iron and Sulphate of Ammonia.

Mr. E. Wightman Bell communicates to the *Chemical News* the results of some experiments undertaken with the object of ascertaining the effects of the use of sulphate of iron as a manure. It is acknowledged that Dr. A. B. Griffiths has strongly advocated the employment of iron sulphate as a fertilizer, and has obtained encouraging results from his trials; still, it was thought that further experiment on the subject might be useful. Mr. Bell's tests were made on potato plots at Spalding Marsh; every care being taken to secure reliable data. In one case, a manure consisting of 3 cwt. of mineral superphosphate per acre, with and without the addition of ½ cwt. of iron sulphate, showed an increased yield of 29 cwt. per acre from the use of the iron salt. In another instance, a mixture of 3 cwt. of mineral superphosphate with 1 cwt. of sulphate of ammonia, with and without the addition of ½ cwt. of iron sulphate, showed an increase, attributable to the iron, of 15 cwt. per acre, which more than fifteen times repaid the first cost of the salt. It consequently appears settled that the addition of sulphate of iron to an artificial manure composed of phosphates and sulphate of ammonia is an improvement of considerable value for potato growing, and may be commended to the consideration of those who are interested in developing the trade in such manures.

Hot Air for Boiler Furnaces.

The features of smoke prevention and fuel economy are equally conspicuous in the Ellis and Eaves system of mechanically induced draught for steam-boilers recently described in the *Engineering Record*. In this system, the combustion gases after leaving the boiler flues are carried back over the top of the boiler through two air-heating chambers; finally passing from these through the necessary connections to an 8-feet Sturtevent fan discharging into the chimney. The air-heating chambers contain a number of 3-inch tubes, each about 12 feet long, through which the air is drawn that supplies the furnace. In its passage through these tubes, the air is highly heated by the waste gases, and is delivered hot both above and below the fires; the amount of air supply to each point being regulated by butterfly valves. Both the fire-doors and the ashpit-doors fit tightly, so as to exclude cold air; and to prevent cold air from entering when the fire-doors are opened for stoking, these are made, as they open, to shut a butterfly valve in the uptake—thus shutting off the draught. Retarders, consisting of long strips of thin steel as wide as the diameter of the tubes, and twisted into a screw of about three turns in the length of the tube, are placed in the boiler-tubes, to check the rush of gases through them. The fan runs at about 520 revolutions per minute; giving a suction of 7½ to 8 inches of water. A boiler so fired might be expected to be practically smokeless with hand, and perfectly so with automatic firing.

The Adhesion of Cement Mortars to Bricks.

Some interesting tests have been carried out by M. Felix de Walque upon the adhesion of cement mortars to brickwork. The results were communicated to a Louvain engineers' society. Five different varieties of bricks were included in these experiments, and as many different descriptions of cement. Moreover, three different gaugings of mortar were made with each cement. The cementing of the bricks together by means of the mortars was carefully done—the bricks having previously been thoroughly soaked in water; and the degree of adherence was tested to breaking after intervals of 2, 4, 8½, 15, and 44 days. The two earlier days gave irregular results; but each experiment was repeated four times, and the mean result taken. It appears from M. de Walque's tables, that the adherence of cement mortars to smooth-pressed, hard bricks is greater than it is to rougher kinds of brick, which is a sufficiently remarkable result. It must be acknowledged, however, that the figures given are still very irregular, even after the elision of the unreliable short-period results.

The Source of Atmospheric Oxygen.

Dr. T. L. Phipson is continuing the experiments by which he is seeking support for his hypothesis (already mentioned in this column) that atmospheric oxygen is entirely the product of plant life extending over countless ages; the primeval atmosphere of the earth having been, according to this hypothesis, simple nitrogen. Dr. Phipson does not say that plants are the creators of oxygen, but only that they are the means by which Nature has placed free oxygen in the atmosphere of the earth. Dr. Phipson's later experiments have tended to show that it is precisely the lowest and earliest forms of plant life which are most active in disengaging oxygen. He found last October that a small 2-oz. bottle, containing about 5 centigrammes of green unicellular algæ, filled with water containing carbonic acid and all the elements of a fertile soil, and exposed to sunlight every day with only a temperature of from 43° to 63° Fahr., produced during the month 14 cubic centimètres of pure oxygen gas. So that a single pound weight of such unicellular algæ will produce at least 420 gallons of oxygen per annum, or 42,000 gallons in a century.

American Views of Mortar.

Writing in an American technical journal on the subject of good mortar, Mr. R. N. Buell declares that the strength of all mortars depends, to a much greater extent than is commonly supposed, upon the mixing. The modern idea that any builders' labourer can make good mortar is a dangerous blunder. The best way to slake the lime is from a hose—sprinkling it until it is in the form of putty—and then covering with sand. One measure of lime to five measures of sand is recommended as the best proportion, to be well mixed, when the bulk of the mortar will exceed that of the sand by about one-eighth. Mr. Buell thinks that the tenacity or cohesive strength of lime mortar should not be taken as more than 15½ lbs. per square inch. It is true that at the end of 4½ years some mortars will have increased their strength two or three fold; but others only strengthen by about one-third more. Besides, in practice, mortar has to do its work within a short time of its being laid. Mr. Buell takes the adhesion of mortar to brick or stone as being at least equal to its cohesive strength. The sliding resistance, or that which common mortar opposes to any force tending to make one course of masonry slide upon another, is very small; being only about one-third of a ton per square foot in mortar six months old. Mr. J. A. Macpherson, of the Rensselaer Polytechnic Institute, has investigated the ordinary builders' practice of mixing lime mortar some time previously to using it. He found it very slightly advantageous; an average breaking strength of 34·6 lbs. per square inch in mortar three days old being raised to 39·3 lbs. after keeping it in a heap for seven days. A gain of 3·8 per cent. of strength was found from the admixture of sugar with mortar when used in air; but no gain if used for subaqueous work. In South America, there has been occasional use of bullocks' blood for tempering hydraulic mortar. It was found that when mortar was tempered with bullocks' blood, diluted with one-third its volume of water, the resulting briquettes were very hard and firm, and set rather more quickly. They showed a gain over the water tempering of 10 per cent. for briquettes set in air.

The Sand Filtration of Water.—We learn from *Nature* that an exhaustive bacteriological investigation of the Altona water supply has been recently published by Dr. Reinsch. Although the results obtained are not specially novel, they are of importance as confirming the researches of other investigators. It is pointed out that whilst the layer of slime which forms on the surface of sand filters plays an important part in the retention of microbes, yet another factor must be most carefully watched if a satisfactory filtrate is to be obtained. This is the depth of the column of fine sand through which the water is made to pass. It was first called attention to by Dr. Percy Frankland in 1886, in the course of his examinations of London water; and since that time investigations made at Zurich and elsewhere have shown that it is not advisable to reduce the layer of sand below 30 centimetres. Reinsch considers that it should never be less than from 40 to 60 c. high. This investigator also states that, in order to encourage the formation of surface lime, the filters, after the water is first run on, should be left undisturbed for twelve hours; and that the neglect of this simple precaution exercised an important influence on the filtrate.

Worthington Pumps to Replace Cornish Engines.—A large order has just been placed by the West Middlesex Water Company with Messrs. J. Simpson and Co., Limited, to build for their pumping-station at Hampton another vertical triple-expansion high-duty Worthington pumping-engine. It will be capable of lifting 16 million gallons of water per day to a head of 120 feet, and will work with a boiler pressure of 120 lbs. per square inch. It will be erected on the old foundations of the one remaining Bull Cornish engine. This station was originally supplied with two Bull engines erected by Messrs. Harvey, of the Hayle Foundry, Cornwall, in about the year 1850; and they were followed in 1873 by another Bull engine. In 1887 a new installation was added in the form of a compound high-duty Worthington engine, made by Messrs. J. Simpson and Co., Limited; and this engine did the work of the station in conjunction with the Bull engines until 1891, when the two older Cornish engines were pulled down, and in their place a vertical high-duty Worthington engine was erected. This new engine will now make the third Worthington engine erected at this station, and the seventh of this type supplied to the Company; the other four being at work at the Hammersmith and Barnes stations. At the Hammersmith station, a large horizontal Worthington engine took the place of two Cornish beam pumping-engines, and was erected in the same house, and on their old foundations in 1890. The Cornish pumping-engines have now for many years done good work for the different London Water Companies; and it is an important sign of the times when they are seen to be disappearing one by one before the advancing march of science, and engines of modern design and manufacture taking their places. But, on the other hand, it should be pointed out that, if it had not been absolutely proved that the adoption of Worthington engines had resulted in so large a saving of fuel to the Companies, the latter would have been the last to replace their old pumping plant, which had served them well, with the new types of machinery.

TECHNICAL RECORD.

THE COMMERCIAL SYNTHESIS OF ILLUMINATING HYDROCARBONS.

Professor Lewes at the Society of Arts.

At the Meeting of the Society of Arts on Wednesday last—Dr. W. Anderson, F.R.S., the Director-General of Ordnance Factories in the chair—the above subject was dealt with by Professor VIVIAN B. LEWES, F.I.C., F.C.S., of the Royal Naval College, Greenwich, in a paper of which the text is given below. The author did not read his communication, but presented it, practically in its entirety, in the form of a highly interesting lecture.

The two methods most used in chemical science for tracing the changes taking place in matter, and determining the composition of bodies, are: Firstly, breaking up compounds into their ultimate constituents—a process which is called "analysis;" and, secondly, by building up the compound from the elementary matters which form it—a process to which the name of "synthesis" has been given. If we take chalk and heat it in the limekiln, or in the chemist's crucible, a heavy, colourless gas, called carbon dioxide, escapes from it, and leaves behind a substance which we know as quicklime. If now this quicklime be further acted upon by chemical methods, it can be shown to contain the metal calcium and the elementary gas oxygen; whilst the carbon dioxide, when collected, can be decomposed into the elements carbon and oxygen. By such a series of operations as this, we might perform the analysis of chalk.

If now we start with the metal calcium, with carbon, and with oxygen, it is perfectly simple to reverse the operation, and rebuild the chalk molecules from these elementary forms of matter. By burning the carbon and calcium respectively in oxygen, we obtain the quicklime and the carbon dioxide; and by bringing these substances together in the presence of moisture, chalk, or calcic carbonate, is once more formed, and we have synthetically built up the chalk from its constituents.

By such simple methods as these most inorganic compounds can be synthetically produced from elementary matter. But in the so-called organic chemistry, it is not so easy to employ such constructive methods for the formation of compounds; and up to the end of the first quarter of this century, it was supposed that organic bodies were only produced as the result of animal and vegetable life, and that their formation was due to the so-called "vital force," which was credited with governing all changes taking place in living organisms. In 1828, Wöhler showed that urea could be formed from cyanate of ammonium; whilst, later on, Fownes made cyanogen by the direct combination of carbon and nitrogen. These two discoveries taken together prove the possibility of forming an organic product from inorganic materials; and after this point had been reached, and the possibility of applying synthetic methods to the production of organic bodies had been demonstrated, compound after compound was built up without the aid of either vegetable or animal life, and the barrier between inorganic and organic chemistry was finally broken down. Cases, however, in which such methods could be commercially successful were few and far between, as in most instances the processes which had to be adopted were costly and laborious.

In all the phenomena of ordinary combustion which we employ to provide us with heat and light, there are no compounds of greater interest than the class of organic bodies which, being formed of carbon and hydrogen in various proportions, have been termed hydrocarbons; and it is to this class of bodies that all the gases which can be used as ordinary illuminants owe their luminosity. Amongst the hydrocarbons, the simplest compound is acetylene, in which two atoms of carbon are united with two atoms of hydrogen; and it has long been known that, if a stream of hydrogen is passed through a globe in which the voltaic arc is produced between carbon points from a sufficiently powerful current, this gas is produced in minute quantities. It can also be formed in small quantities by the decomposition of carbon tetrachloride in the presence of hydrogen by the induction spark; whilst it is produced during processes of checked combustion in hydrocarbon flames.

The direct combination of carbon and hydrogen in the electric arc is a true case of synthesis; and if we could form acetylene in this way in sufficiently large quantities, it would be perfectly easy to build up from the acetylene the whole of the other hydrocarbons which can be used for illuminating purposes. For instance, if acetylene be passed through a tube heated to just visible redness, it is rapidly and readily converted into benzol; at a higher temperature, naphthalene is produced; whilst by the action of nascent hydrogen on acetylene, ethylene and ethane can be built up. From the benzol we readily derive aniline, and the whole of that magnificent series of colouring matters which have gladdened the heart of the fair portion of the community during the past five-and-twenty years; whilst the ethylene produced from acetylene can be readily converted into ethyl alcohol, by consecutively treating it with sulphuric acid and water. From the alcohol, again, an enormous number of other organic substances can be produced. So that acetylene can, without exaggeration, be looked upon as one of the great keystones of the organic edifice; and, given a cheap and easy method of preparing it, it is hardly possible to foresee the results which will be ultimately produced.

From acetylene, we can produce all those bodies which we are accustomed to look upon as the most important ones in our coal gas, and which, up to the present time, have never been produced from anything but coal, hydrocarbon oils, or other organic matter undergoing destructive distillation. But it has often occurred to those of us who are interested in the manufacture of illuminating gas, to ask, as the coal supply gets smaller, and as oil in time begins to share the same fate, from what sources are our illuminants and our fuels to be obtained? And, in my mind, at any rate, the synthetic production of hydrocarbons has long been a day-dream, which I, however, never expected to see possible on a commercial scale.

Not only was the synthetic production of acetylene in the electric arc well known, but ever since water gas has been introduced, small traces of acetylene and methane have been found in it under conditions which render it impossible that they should have been produced from any compound present in the incandescent fuel. They must have been due to the direct combination of carbon and hydrogen. But these traces only occurred in quantities so small as rarely to amount to 1 per cent.; and it was manifest that the production of the compounds could not take place in large quantities under influences which would immediately tend to decompose them.

In 1836, it was found that, when making potassium by distillation from potassic carbonate and carbon, small quantities of a bye-product consisting of a compound of potassium and carbon was produced, and that this was decomposed by water, with liberation of acetylene; whilst Wöhler, by fusing an alloy of zinc and calcium with carbon, made calcic carbide, and used it as a source from which to obtain acetylene by the action of water. Nothing more was done until 1892, when Macquenne prepared barium carbide by heating at a high temperature a mixture of barium carbonate, powdered magnesium, and charcoal. The resulting mass evolved acetylene, when treated with water. Still later, Travers made calcic carbide by heating together calcic chloride, carbon, and sodium. None of these processes, however, gave any commercial promise, as the costly nature of the potassium, sodium, magnesium, or zinc-calcium which had to be used, made the acetylene produced from the carbide too expensive.

It is now some 25 years ago that I listened to one of the Friday evening lectures at the Royal Institution, given by Mr. Greville Williams; and, in the same way that the strain of some melody lingers in one's mind, so has the concluding sentence of that lecture constantly recurred with ever-increasing force: "The impossible is a horizon which recedes as we advance; and the *terra incognita* of to-day will to-morrow be boldly mapped upon every schoolboy's chart." And the haunting dream of the possibility of synthesizing hydrocarbons commercially has, with the onward march of science, to-day become an accomplished fact.

As is so usual in the history of discovery, the factor which has endowed us with the power of doing this was not the outcome of an elaborate research having this discovery for its ultimate goal. It was found by chance during the search for another object. Whilst working with an electric furnace, and endeavouring by its aid to form an alloy of calcium from some of its compounds,* Mr. T. L. Willson noticed that a mixture containing lime and powdered anthracite, under the influence of the temperature of the arc, fused down to a heavy, semi-metallic mass, which, having been examined, and found not to be the substance sought, was thrown into a bucket containing water. The result was that violent effervescence of the water marked the rapid evolution of a gas, the overwhelming odour of which enforced attention to its presence, and which, on the application of a light, burnt with a smoky, but luminous flame.

Investigation into the cause of this phenomenon soon showed that in a properly constructed electric furnace, finely ground-up chalk or lime, mixed with powdered carbon in any form—whether it were charcoal, anthracite, coke, coal, or graphite—can be fused, with formation of the compound known as calcic carbide, containing 40 parts by weight of the element calcium (the basis of lime), and 24 parts by weight of carbon; and that, on the addition to this of water, a double decomposition takes place, the oxygen of the water combining with the calcium of the calcic carbide to form calcic oxide or lime, whilst the hydrogen unites with the carbon of the calcic carbide to form acetylene. The cost of the gas so produced brings it not only within the range of commercial possibilities for use *per se*, but also for the building up from it of a host of the other compounds; whilst the production of the calcic carbide from chalk, and from any form of carbon, renders us practically independent of coal and oil, and places in our hands the prime factor by which Nature in all probability produces those great underground storehouses of liquid fuel on which the world is drawing so largely to-day.

Wonderfully and intensely interesting as is the train of thought opened up by the discovery of this substance and its commercial production, the object I have in view this evening is not to

* An illustration of the furnace here referred to appeared in last week's number of the JOURNAL, p. 120.

discuss theoretic possibilities, but to show you the important effect which it will have in the direction of our great gas industry; and the phase of this which I wish to deal with specially is the value of acetylene, either for producing *per se* an enormously high illuminating effect, or for the enrichment of low-grade coal gas.

When the calcic carbide is placed in a glass flask, and water is allowed to slowly drip upon it from a dropping-tube, the decomposition at once commences with considerable rapidity; and the acetylene pours off in a continuous stream. As the decomposition continues, the solid mass in the flask swells up, and is eventually converted into a mass of slaked lime. Calcic carbide is a dark grey substance, having a specific gravity of 2·262; and, when pure, 1 lb. of it will yield, on decomposition, 5·3 cubic feet of acetylene. Unless, however, it is quite fresh, or means have been taken to carefully protect it from air, the outer surface gets slightly acted upon by atmospheric moisture, so that in practice the yield would not exceed 5 cubic feet. The density and hardness of the mass, however, protects it to a great extent from atmospheric action; so that in lumps it does not deteriorate as fast as would be expected, but in the powdered condition it is rapidly acted upon. For commercial purposes, the carbide will be cast direct from the electric furnace into rods or cylindrical cartridges, which, when 12 inches long and 1¼ inches in diameter, will weigh 1 lb., and give 5 feet of gas.

The acetylene so made, when analyzed by absorption with bromine—the analysis being also checked by determining the amount present by precipitation of silver acetylide—gives 98 per cent. of acetylene, 2 per cent. of air, and traces of sulphuretted hydrogen; the presence of this impurity being due to traces of sulphate of lime (gypsum) in the chalk used for making it, and to pyrites in the coal employed.

Acetylene is a clear, colourless gas with an intensely penetrating odour, which somewhat resembles garlic; its strong smell being a very great safeguard in its use, as the smallest leakage would be at once detected. Indeed, so pungent is this odour, that it would be practically impossible to go into a room which contained any dangerous quantity of the gas. This is an important point to remember, as the researches of Bistrow and Liebreich show that the gas is poisonous, combining with the hæmoglobin of the blood to form a compound similar to that produced by carbon monoxide; whilst the great danger of the latter gas is that, having no smell, its presence is not detected until symptoms of poisoning begin to show themselves. No fear, however, need be apprehended of danger from this source with acetylene.

Acetylene is soluble in water and most other liquids; and at ordinary temperature and pressure—60° Fahr., and 30 inches of mercury—10 volumes of water will absorb 11 volumes of the gas. But as soon as the gas is dissolved, the water, being saturated, takes up no more. Water already saturated with coal gas does not take up acetylene quite so readily; whilst the gas is practically insoluble in saturated brine—100 volumes of a saturated salt solution only dissolving 5 volumes of the gas. The gas is far more soluble in alcohol, which at normal temperature and pressure takes up six times its own volume of the acetylene; whilst 10 volumes of paraffin, under the same conditions, will absorb 26 volumes of the gas. It is a heavy gas; having a specific gravity of ·91.

When a light is applied to acetylene, it burns with a luminous and intensely smoky flame; and when a mixture of 1 volume of acetylene, with 1 volume of air is ignited in a cylinder, a dull red flame runs down the cylinder—leaving behind a mass of soot, and throwing out a dense black smoke. When acetylene is mixed with 1·25 times its own volume of air, the mixture begins to be slightly explosive. The explosive violence increases until it reaches a maximum with about twelve times its volume of air; and it gradually decreases in violence until, with a mixture of 1 volume of acetylene to 20 volumes of air, it ceases to be explosive.

The gas can be condensed to a liquid by pressure. Andsell found that it liquefies at a pressure of 21·5 atmospheres, at a temperature of 0° C.; whilst Cailletet found that at 1° C. it required a pressure of 48 atmospheres. The first-named pressure is probably the correct one. The liquid so produced is mobile, and highly refractive, and when sprayed into air, the conversion of the liquid into the gaseous condition absorbs so much heat, that some of the escaping liquid is converted into a snowlike solid, which takes fire on applying a light to it, and burns until the solid is all converted into gas and is consumed.

In my researches upon the luminosity of flame, I have shown that all the hydrocarbons present in coal gas and other luminous flames are converted, by the baking action taking place in the inner non-luminous zone of the flame, into acetylene before any luminosity is produced. Also that it is the acetylene which, by its rapid decomposition at 1200° C., provides the luminous flame with those carbon particles, which, being heated to incandescence by various causes, endow the flame with the power of emitting light. The acetylene, being in this way proved to be the cause of luminosity, one would quite expect that in this gas we should have the most powerful of the gaseous hydrocarbon illuminants; and experiment at once shows that this is the case.

Owing to its intense richness, it can only be consumed in small flat-flame burners; but under these conditions it emits a light greater than that given by any other known gas—its illuminating value (calculated to a consumption of 5 cubic feet an hour) being no less than 240 candles.

Illuminating Power of Hydrocarbons for a Consumption of 5 Cubic Feet of Gas.

	Candles.
Methane	5·2
Ethane	35·7
Propane	56·7
Ethylene	70·0
Butylene	123·0
Acetylene	240·0

Having arrived at this startling result, it will be as well to at once turn to the commercial aspect of the problem, as it is upon this that the utilization of this magnificent illuminant is entirely dependent. At the present time, private information from America shows that calcic carbide can be produced at a little under £4 a ton; and the beautifully pure lime obtained by the decomposition would be worth to the gas manager at least 10s. a ton. As a ton of the carbide will give rather more than 1¼ tons of quicklime, or 1¾ tons of slaked lime, £3 10s. may be taken as the cost of the acetylene produced from a ton of the material, and will leave a margin for handling. A ton of the carbide will yield, in practical working, 11,000 cubic feet of acetylene, which will bring out the cost of the gas at 6s. 4½d. per 1000 feet.

The cheapest and best enrichment process known at the present time is that introduced by Mr. Young, which has been adopted at a number of gas-works in Scotland and the North of England. In this process, by special methods of retorting, oils are decomposed to yield a rich gas, which, in the photometer, and burnt in suitable burners *per se*, gives an illuminating value of about 60 candles, but for which an enrichment value of 96 candles is claimed.

I am desirous of understating rather than overstating the powers of the acetylene; so that, instead of taking enrichment values for it which might be questioned, I prefer to simply take the illuminating power of the gas when burnt *per se*, and the light measured in the photometer. This, as before stated, is 240 candles. For the same reason, we will take the claimed enrichment value of the Young gas, instead of its photometric value. An extended experience, gained with the Young process as used at St. Helens for the enrichment of coal gas, shows that the cost may be taken at 3s. 4d. per 1000 cubic feet. If now we compare this with the acetylene at 6s. 4½d. per 1000 cubic feet, we find that the 240-candle gas at this price would be equal to Young gas at 2s. 6½d. Moreover, the Young plant, to work a ton of oil per diem, costs (according to the experience at Peebles) £1500, and generates 22,000 cubic feet of gas a day. The retorts for this purpose occupy a very considerable space. To make the same volume of acetylene, 2 tons of material would have to be handled; and the whole operation could easily be carried out in one small egg-ended boiler, fitted with an automatic water-feed and automatic gas-delivery valve to the outlet of the main for the holder. Thus the enriching gas could be added *pro ratâ* to the gas as it left the works, in order to bring it up to any required strength—in the same way as is done with the Maxim-Clark enrichment—and all the troubles of stratification in the holder would be done away with. For the first few hours, the water in the consumers' meters would absorb small quantities of the acetylene; but, quickly becoming saturated, no further absorption would take place.

It is well known that acetylene forms two compounds with ammoniacal solutions of the metals silver and copper; and both of these compounds, when dry, can be readily exploded by percussion, friction, or heat. In the early days of gas supply, copper pipes were used in New York; and Torrey, in 1839, found in them a brown scaly deposit, which exploded when struck or heated to 200° C., and which was, in all probability, acetylide of copper. An extended series of experiments on this point show that, when metals are kept in the gas, even if moisture be present, no action takes place unless water condenses on the metal, when tarnishing with silver and copper (and to a less degree with brass) commences. Under these conditions, an acetylide of mercury can also be formed; but the other metals remain unacted upon. If, therefore, iron, tin, lead, or compo pipes be used for the gas supply, no precautions are necessary. Copper and brass tubes must either be coated inside with some varnish not acted upon by the acetylene, or be tin lined.

In America, which was the birthplace of this method of making calcic carbide, the acetylene is mixed with an equal volume of air, and the mixture burnt at small slit burners. But I confess to grave mistrust of this method of using the gas, as the margin of safety in the amount of air required to convert the mixture into an explosive is so small, that the danger of exceeding it on any large scale must be very great. Any mistake or alteration in the mixing apparatus used for this purpose might easily bring the percentage of air up to the explosive limit; whilst the diluting action of the nitrogen of the air reduces the illuminating value of the acetylene from 240 to 130 candles.

The possibility of liquefying acetylene by pressures about those at which liquid carbon dioxide is produced so largely, enables enormous volumes of gas to be compressed into the liquid state in the small wrought-iron or steel cylinders; and in this condition, by means of suitable reducing-valves and burners of the right construction, it may be stored and burnt. Used in this way, it will be of the greatest possible value for floating buoys. The small cylinders can also be arranged in the form of portable lamps; whilst for use in the country, where

no gas is available, a large cylinder of the liquid gas placed in an outhouse would supply a country house with light for a very long period. There is, no doubt, a great field for it in this direction; as, by utilizing suitable burners, a consumption of ½ cubic foot an hour will give a light of from 20 to 25 candles.

Perhaps the most valuable suggestion which has been made with regard to the utilization of this remarkable method of making acetylene, is that advantage should be taken of the method of preparation to utilize the body for making portable lamps for dining and drawing rooms in places where no gas supply exists. To do this, a strong steel cylinder, 4 inches in diameter and 16 inches in length, is fitted with an opening in the top of such size that a 1 lb. cartridge or stick of the calcic carbide can be passed through it. The cylinder has a second opening at the bottom, closed by a screw, for cleaning out the lime left by the decomposition. The right proportion of water is put into the cylinder; and the stick of carbide (coated with a slowly soluble glaze) is inserted, and the head of the lamp screwed on. This head contains a double reducing pressure-value, which brings down the pressure existing in the cylinder to that necessary for the proper consumption of the gas. It is also fitted with a valve. As the glaze dissolves from the surface of the carbide, acetylene is generated; and the 5 cubic feet are compressed by their own pressure. The cylinder is stood in a vessel of cold water whilst the gas is generating; and the gas can then be burned from a suitable jet at the rate of ½ cubic foot per hour, which will give a light of over 20 candles for something like ten hours. When the gas is all burnt out from the cylinder, the top of the lamp is screwed off; the bottom plug also removed; the lime washed out from the interior of the cylinder by a rapid stream of water; and recharged as before. Used in this way also, this gas would rapidly replace oil gas for railway lighting, as the fittings at present in use for the Pope and Pintsch systems would answer perfectly well for the purpose of using acetylene; the only difference being that the cylinder placed below the carriage, which under the present conditions is filled with compressed oil gas, would be utilized not only as a storing, but as a generating vessel for the acetylene. The highly expensive oil gas manufacturing and pumping plant would be done away with; and a magnificent illumination ensured in the carriage.

Of late years, an idea has been slowly permeating the minds of some gas managers in this country, that it might be well to adopt a dual gas supply—one for fuel purposes, which would consist of a poor coal gas of about 12 candles, whilst the gas for illuminating purposes would be of about 20 candles. In one town, at least, it has been proposed, and, I believe, carried out, that a supply of poor quality coal gas should be sent out during the day, when the maximum consumption is for heating purposes, and a richer gas at night for illuminating purposes—utilizing the same mains for both. Although this is possible in a small town, where the area to be supplied is not large, it would be impossible in a big town where many miles of huge mains have to be traversed before certain districts are reached; and the cost of a double set of mains would render a dual supply an impossibility. The use of acetylene would, however, render it possible for the gas company to send out a 12-candle gas for heating purposes, both by night and day; whilst a small enrichment cylinder might be attached to the gas outlet-pipe from each consumer's meter, and which would be made to automatically enrich the gas supplied to his house, so that by setting a valve he could have any quality he might desire.

The economic value of an illuminant such as acetylene becomes apparent when we compare the cost of the gas for equal illumination with the light obtained from other illuminants. London gas has an illuminating power of 16 candles; whilst acetylene has an illuminating value of 240 candles. This, at 6s. 4½d. per 1000 cubic feet, would, in light-giving value, be equivalent to London coal gas at less than 6d. per 1000 feet.

In order to obtain a given illumination, moreover, the volume of gas to be consumed is excessively small as compared with any other illuminating gas; and the products of combustion are reduced to an excessively low limit. In London, 100 cubic feet of coal gas will yield 50 cubic feet of carbon dioxide and 140 cubic feet of water vapour as the products of its complete combustion; whilst 100 cubic feet of acetylene would yield 200 feet of carbon dioxide and 100 feet of water vapour. The acetylene, however, in its combustion, gives a light of 240 candles, as against 16 candles yielded by the coal gas. For equal illumination, therefore, the amount of carbon dioxide and water vapour produced is enormously smaller.

The following table contrasts the products of combustion evolved from London coal gas, when consumed in various forms of burners, and giving an illumination of 48 candles, which may be presumed to be the amount of light required in a fair-sized London dining-room, and contrasted with this is the amount of the products of combustion which acetylene would evolve in giving the same amount of light. To make the meaning clearer, I have added the number of adults who would exhale the same amount of carbon dioxide in the same time:—

Burner.	Gas Consumed.	Carbon Dioxide Produced.	Adults.
Flat flame, No. 6	19·2 ..	10·1 ..	16·8
Flat flame, No. 5	22·9 ..	12·1 ..	20·1
Flat flame, No. 4	25·3 ..	13·4 ..	22·3
"London" Argand . . .	15·0 ..	7·9 ..	13·1
Acetylene	1·0 ..	2·0 ..	3·6

If we obtained the same amount of light from paraffin lamps, the carbon dioxide evolved would be equivalent to 22·5 adults; while as far as carbon dioxide goes, you might as well invite 32·7 more guests to dinner as use 48 sperm candles to supply the needed illumination.

The flame of acetylene, in spite of its high illuminating value, is a distinctly cool flame. In experiments which I have made by means of the Le Chatelier thermo-couple, the highest temperature in any part of the flame is a trace under 1000° C.; whilst with coal gas burning in the same way in a flat-flame burner, the temperature rises as high as 1360° C. If the heating effect of the flames be contrasted for equal illumination, it will be seen that the acetylene flame has so small a heating effect, considering its area, that it would not be much greater than the ordinary electric incandescent lamp.

The intensity of the light will make small acetylene lamps of enormous value for lantern projection, for railway signals, and (coming down to smaller things) bicycle lamps; whilst I should imagine the ease of production specially adapts it for such purposes as lighthouse illumination.

The scope and possibilities of such a discovery as that which I have brought before you this evening cannot be realized until many factors, at present unknown, are thoroughly worked out. You must remember also that the time at my disposal has only enabled me to bring before you to-night some facts connected with the light-giving value of this hydrocarbon. As a stepping-stone to the synthesis of other bodies, its value will be incalculable; and one cannot help feeling that, as science grows, and as our grasp and comprehension of the marvellous processes by which Nature builds up her matter become more and more extended, synthesis may have even greater conquests to make than the mere building up on a commercial scale of an illuminating hydrocarbon.

We are beginning to realize more and more fully the marvellous way in which Nature keeps matter in circulation; the way in which animal and vegetable structures are built up from the simplest and most plentiful substances; and the way in which, when the structure is done with, those processes of slow combustion, which we call decay, again convert the waste bodies into carbon dioxide and water vapour, from which once more Nature reconstructs the vegetable and animal kingdom. And it may be that as our perception of the methods of that marvellous natural architecture gets clearer and keener, we may discover how, by simple synthetic processes, the carbon dioxide and water vapour which form Nature's building material may be synthetically utilized by us in building up, not the perfected form of man, or animal, or plant, but the building on a commercial scale of the food which is required by Nature for carrying on the functions necessary for life.

[During the lecture, Professor Lewes demonstrated how the acetylene is produced from the calcic carbide, and showed the gas burning, with beautifully bright flames, from a cluster o jets.]

Discussion.

The CHAIRMAN invited discussion on the lecture, which he characterized as a brilliant one in every respect,

Mr. LEWIS T. WRIGHT endorsed the Chairman's observation. He remarked that the lecture was peculiarly interesting to technical men, probably in a double sense, because they had an interest in the scientific side, and also in the possible commercial side, of any such reaction as Professor Lewes had described. There was one question he must ask, and that was whether, in the course of the Professor's experiment, he had proved that the high luminosity of acetylene was retained when it was mixed with coal gas, for example, as an enricher—whether, *pro ratâ*, acetylene, per cubic foot, had the 50 candles illuminating power that it had when it was burned in the pure condition. Probably this experiment had been tried. It might be thought by many present that this would necessarily follow; but he had reason for knowing that in such cases the luminosity produced by mixtures of gases of different qualities was not always the arithmetical mean of that of the gases employed. This was rather an important point, which it would be interesting to have explained.

Mr. W. SUGG said the whole matter just brought before them was so surprising, from many points of view, that it was extremely difficult to offer many remarks upon it. One thing that particularly struck him was the fact that acetylene appeared to have such a powerful affinity for oxygen. They generally found, when they tried to burn gas of very rich quality, that it was difficult to get enough air mixed with it to provide a sufficient quantity of oxygen to produce a brilliant light. But from the gas before them, which he should have thought would have given a very smoky flame, they had a highly brilliant one. This could only result from the fact that the oxygen of the atmosphere had such a powerful affinity for it that it rushed to it, and so provided it with a greater amount of oxygen than could be furnished by any means known—except, perhaps, the Welsbach light—for bringing the oxygen of the atmosphere into combination with the hydrocarbons of the gas. The gas before them seemed to be really as brilliant as if it were burning as an oxy-hydrogen light. Having never seen the thing before, he could not say whether or not his view was correct; but it seemed to him that the reason he had given was the only explanation of

why it was possible to get such a light from so very rich a gas. There did not appear to be much speciality in the burners.

Professor LEWES said there was a little; but still, in the main, Mr. Sugg was right.

Mr. SUGG said he could not imagine that any difference in the burner would produce that magnificent light without an extraordinary affinity of the gas itself for oxygen. As to the manufacture of the gas itself, it seemed so easy that most of them thought they could probably do it straight off for themselves. He did not know whether or not this was possible. Perhaps they might find some difficulties when they came to try it. At any rate, there was certainly a very wonderful effect produced; and the matter ought to be thoroughly examined.

Mr. C. C. CARPENTER said he must first congratulate Professor Lewes on the result which had followed his well-known researches into the effect of acetylene on the luminosity of gas-light. The fact that in so short a time afterwards one was able to manufacture acetylene on a commercial scale, must have been a very pleasing surprise to him. He (Mr. Carpenter) would like to emphasize the point Mr. Wright had put with reference to the enriching value of acetylene; and he was somewhat disappointed that it was not expressed in the way Mr. Wright had suggested as being desirable—viz., the enriching instead of the direct effect, which was, of course, more important supposing acetylene to be used on the scale which Professor Lewes considered would come about in the very near future. It was somewhat difficult to discuss a paper of which one had no knowledge beforehand; but one point that occurred to him was with reference to the production of the carbide of calcium at the figure mentioned—£4 a ton. It seemed to him that, for the manufacture of an article which could only be obtained by the aid of an electric furnace, this price per ton was very low; and he should be glad if the author could throw some light on the method of producing electricity for forming the carbide. The whole thing hinged on the commercial aspect; and the more light the author could throw upon the cost of the carbide per ton, the more value would attach to it from a commercial point of view. At any rate, Professor Lewes had done something which would be a great relief to the electric light engineer, as he would at last be able to get a level load-line on his machinery by employing it to prepare a material for the manufacture of gas.

Mr. T. S. LACEY said one thing which struck him was that a great many people thought some process such as that of Mr. Young should have been adopted more largely by gas companies, on account of the cheapness of the gas produced. In a gas such as they had in London, however, the amount of enrichment was really a small percentage of the total value of the light; and consequently that portion of the light varied very much. Sometimes they were obliged to add one candle, sometimes two candles, and at other times only half a candle; while occasionally they added nothing at all. The result was that the plant necessary for the maximum amount of enrichment would have to be equal to the use of 10 or 15 per cent. of cannel—that was to say, for the heaviest make in winter; and this would necessitate having a very large plant on the works in order to deal with the lowest requirements. This necessitated large capital outlay for the Young plant. Where carburetters were used, the first cost of the plant was rather low; and it would be in favour of this method that the capital outlay for enriching would be very small. The interest on capital laid out for plant for making oil gas, where the requirements varied over one week from 10 to 15 per cent. of cannel to nothing at all, would be very large.

Mr. J. W. HELPS said he could only reiterate what had been said by previous speakers—that the subject brought before them had been extremely interesting; and they all hoped it would be of great advantage to the gas industry in the future. In speaking of the process of enrichment, which was suggested in connection with the acetylene, Professor Lewes said it would be employed much in the same manner as the Maxim-Clark process—that was to say, it would be applied to the gas after leaving the holders. He should like to ask Professor Lewes if he had tried whether this gas had any effect on the prevention or the absorption of naphthalene deposits. Many companies were now using these enriching bodies partly with the general idea of improving the gas, and partly with the view of preventing or removing naphthalene. This seemed a most important point, and one, no doubt, which Professor Lewes had gone far to clear up. He must also agree with what Mr. Carpenter had said with respect to the cost of production of this carbide of calcium. It seemed to him that, produced as it was by an electric current, it was a remarkably low price; and, as it came from the other side of the Atlantic, he should like to ask whether it was not based on electricity produced by water power.

Mr. FRANK MEAD said the subject brought before the meeting in the paper had been quite a novelty to those interested, and, in particular, to those who were connected with the gas industry. Former speakers had touched on one or two points which he should have dealt with himself, more particularly with regard to the commercial aspect of the question—the cost of the production of the carbide. If it was produced as a bye-product where a process was going on of which the object was to get some other substance, and this material was obtained incidentally, one could understand that it might be sold at a comparatively low price; but if the electric furnace was at work for the sole production of the material, would it then be possible to produce it at £4 a ton? Of course, if it were extensively used, it would have to be capable of production in large quantities; and he took it that, if the gas interest of the world were to adopt such a process, and if it were found advisable to use it, the quantity of material required would be extremely great. What effect this would have on the price, it was difficult to say. Another point of great interest which had not been mentioned was this: Professor Lewes said that the acetylene gas unburnt had a remarkably unpleasant odour which made itself manifest, so that no one would care to stay in a room where there was such a large proportion of it present as to be dangerous to life. But was there any odour given off when the gas was consumed at the burner? Professor Lewes had observed that it would be useful for burning out of doors; but was it perfectly odourless when burnt in a room? One could see no reason why there should be an odour produced by its combustion; but this was a point which deserved attention. Another was this: There must be a vast difference between the specific gravity of ordinary coal gas and that of acetylene; and he thought there might, perhaps, be some "layering" of the two gases when mixing one with the other so as to produce the required compound. The mixture of it with ordinary gas as it went away from the holder was a very different thing from adding the enricher to the gas that went into the holder. There was not the same opportunity for layering in the one case as in the other. He could only add his tribute of praise to Professor Lewes for the way in which his lecture had been delivered.

Mr. FRANK WRIGHT said he desired to ask Professor Lewes one question; but, before doing so, he would like to recall to memory a little ditty by the late Mr. F. W. Hartley, which he wrote in praise of electricity and gas going hand in hand. It must be very gratifying to both gas and electrical engineers, not only to listen to the brilliant lecture they had heard, but to find that electricity was, to some extent, offering to befriend gas. In the case of a recent explosion, and in other things, the reverse had been the case. He now wished to ask Professor Lewes if he had any information as to the value in candle power of the horse power of electrical energy, as it seemed to him that everything hinged upon that. If gas companies did not take up this process, perhaps the electrical concerns might work it round in one of those little cycles of synthesis and analysis of which they had heard.

Mr. H. O'CONNOR asked if Professor Lewes could say what would be the result of mixing acetylene with water gas—whether or not it would be an explosive mixture; because, if not, the smell given off from the acetylene might be a means of causing water gas to be used, by enabling one to know when it was escaping.

Mr. MANUEL asked whether, if an escape of acetylene took place in a room, and the gas united with the atmosphere, there would be a danger of explosion if anyone went into the room with a naked light; and, if so, would it be more severe than in the case of an ordinary gas explosion.

Professor LEWES, in reply, remarked that it was very curious how, in a discussion of the character of the present one, it was always found that particular stress was laid on the very point which one wished to keep locked up in one's own breast for a short time. When he saw Mr. Lewis Wright rise, knowing what a master of the whole subject he was, he (Professor Lewes) fully expected something of this sort would follow. Enrichment was one of the most complex questions they could have to deal with; for they found that enrichers varied, as Mr. Wright had pointed out, to an extraordinary extent. If they took an enrichment curve, they never found it to be one of those regular, convenient curves, in which they had 1 per cent., 2 per cent., and so on, going up in proper proportion, but one in which they always had a flattish piece at the bottom, and then gradually rising to the proper point. This had been overlooked time out of mind. He was now working out the enrichment value for a large number of pure hydrocarbons and hydrocarbon mixtures; and he thought he was gradually getting to the bottom of the secret which had been so hampering people in this matter. He did not propose to bring this forward at the present moment, as he wanted it for another paper; but he could answer the question about acetylene. When they added acetylene in small quantities to coal gas, the enrichment value was about 1½ per cent. at the bottom of the curve. From this it went up fairly rapidly, until, when they were making 50-candle gas, it reached nearly its maximum enrichment. The addition of 1 per cent. gave about 12 candles for low values; and then they had a rapid rise until it went to 50 candles. This was also the case with ethylene, ethane, and several others.

Mr. L. T. WRIGHT said he gathered that at 50 candles they obtained the same value in the mixture as in pure acetylene.

Professor LEWES said they came very close to the true value. This was the case with coal gas; but with water gas—and this would answer another query—for a reason of a very beautiful character, it was practically hardly of any use as an enricher. This was why it was found that, in American practice, they talked about 80 or 90 candles. If they took pure water gas—carbon monoxide and hydrogen, with small traces of impurities—and mixed 10 per cent. of acetylene with it, they would have a non-luminous flame. He knew the reason of this; but he could not on that occasion go into it. It showed, however, that acetylene was absolutely useless for the enrichment of gas

of that character. With hydrogen alone, or with carbon monoxide alone, of low value, it was of no use; but when they came to high values, its power appeared once more. Exactly the same thing was found by Dr. Percy Frankland in regard to ethylene. But with coal gas the enrichment value was very great; and this for perfectly apparent scientific reasons. No doubt the burning question, after that of enrichment, was the price of the carbide; and he believed that, in the American experiments which were quoted, giving a price of $15 per ton, undoubtedly water power was used for the production of the electricity. But there was another point in this connection he would ask his hearers to think over. Acetylene was not only a benefactor to the gas world, in the direction of enrichment, but he should say that it would also be a benefactor to the electric world. They all knew that, in the big installations which were being employed for the development of power for supplying incandescent and other electric lights, there was only a possibility of using the plant for one-fifth of each day. Therefore the electric lighting companies had to pay interest on all this dead time; and they had to make, or try to make, dividends in the face of this tremendous obstacle. This meant not letting the fires out, but banking them up; and the long standing of the plant was a great trouble. They were all aware what happened to plant which stood for four-fifths of its life; and he ventured to think that, when it could be shown that there was a market for calcic carbide, they would find at the same time that many of the big generating stations would be glad to regard as a helper rather than as an enemy, the making of this material for producing acetylene. Electric lighting was not all in the hands of one corporation. If it were, they might consider it worth their while to stifle this manufacture, if they thought its illuminating value was going to interfere with them. But there were a number of corporations, all struggling one against the other to show good returns; and he ventured to think that, if they could use the leads from the dynamos for an electric furnace during the hours of daylight, and for the generation of light during the other period, there need be no fear that they would not be able to get a supply of electricity for this purpose at a reasonable price. This was his own view. He did not know how far it was practicable, and how far not practicable; but it appeared to him, on the surface, as a fairly tenable argument. Mr. Sugg looked with surprise on the possibility of being able to burn gas of such high illuminating value as that of acetylene; and he pointed out that this must be due to its having a very great affinity for oxygen. But the luminosity of a flame was not due entirely to its affinity for oxygen. The light obtained from a flame was dependent upon certain exceedingly complex chemical reactions, a few only of which had yet been thoroughly worked out; and it might be a surprise to many present to find that the acetylene flame, giving the marvellous light they had seen, which suggested incandescence of the highest character, was a flame far cooler than that of an ordinary gas-burner. With 16-candle coal gas, the flame had a temperature in various parts rising as high as 1400° C. In the case of the acetylene flame, in no part was there a temperature of more than 900° C.; and, being a cool flame, the products of combustion came off at a temperature which would render it pleasant in a room. There would be no overheating from the flame; and, moreover, there were no noxious products of combustion. There were no products which were in any way offensive to the senses, and none of incomplete combustion. If there were incomplete combustion, the flame would smoke so furiously that it could not be allowed to go on; and it was only when there was incomplete combustion that any smell would arise. This would only give rise to the same products that were given off in the incomplete combustion of ordinary coal gas—viz., simply carbon dioxide and water vapour; and, considering its high illuminating power, the quanttty produced was exceedingly small. When they came to read the paper in print, it would be found that some of the points which had been raised were dealt with, but which he had omitted in delivering his lecture—for instance, the specific gravity of the gas was stated as ·91, or about double that of coal gas. It must be remembered that, when they mixed the gas in bulk, there was no stratification if it was done before it went into the holder. This did not mean simply tumbling one gas into the other, which would cause stratification; but the amount they would have by putting the gas, at a regular rate, into the outlet-main would not be nearly so great as in the other case. One important point had been raised by Mr. Lacey on the subject of enrichment. They all knew that—for instance, in London—there was a perfectly monstrous waste of enrichment in order to obtain the statutory quality of gas. At Beckton, for example, enough enrichment had to be put into the gas to bring it up to a safe limit above 16 candles at the burners. At the present time they were employing processes of enrichment, such as carburetted water gas; and, in order to make quite sure of not being penalized, the gas was being sent out at a margin above the statutory limit, which was quite absurd. In the City, more often than not, 17-candle gas was being supplied, simply to avoid the enormous chances of a change in temperature bringing down the illuminating power, and so rendering the Gas Company liable to a penalty. All practical men would agree that this was entirely wrong. There ought not to be the necessity for putting in this surplus enrichment. As a matter of commercial dealing, if they had to supply 16-candle gas, it was only reasonable that they should supply it as near to 16 candles as possible; and if they had a process which needed so large a margin of safety, it was a wrong process. It needed this large margin, because, where they relied on anything which consisted to a considerable extent of vapours, they must have a sufficient surplus to prevent the risk of the "skin friction" in the mains, which was an even more important factor than cold, in bringing it out again. If they employed acetylene in the same way as they used the Maxim-Clark process, they could enrich the gas coming from the holder up to 16·4 or 16·5 candles; and there would not be the remotest chance of this power coming out of it, because they would not be dealing with a vapour, but with a fixed gas. He thought this fact would commend itself to the mind of every gas manager. The point raised by Mr. Helps was whether, when they enriched by means of acetylene, it would have any effect on the naphthalene. It would not. Naphthalene was taken up by gases like those that were given off by petroleum spirit or naphtha, such as was used in the Maxim-Clark process, because they had there the solvent effect of the vapour of a liquid. The vapour of these light hydrocarbon oils would dissolve and move on the naphthalene; but acetylene would not. Mr. Frank Wright asked a question as to the relation existing between candle power and electric horse power; and he (Professor Lewes) should put it in this way. If they took an electric horse-power, and converted it into the incandescent light, and if they also converted this horse power into calcic carbide, and then obtained the illuminating power from it, the respective values might be taken as 28:44. He had only, in conclusion, to thank his audience for having treated his subject so leniently; and he hoped it would prove to be of permanent value.

The CHAIRMAN then proposed a hearty vote of thanks to Professor Lewes for his admirable lecture. He said it seemed to him that they were indebted to the lecturer for showing them how an ornamental gas-works might be made, and apparently at very much less cost than the present structures, which could not possibly, by any stretch of the imagination, be called ornamental. Another thing that struck him was that they seemed to be getting very near to that great *desideratum* of a level load-line in electrical matters; and that the process before them would afford a very good form of storage battery for electricity. The electric energy in the furnace came out in the form of a stick, which could be carried in the pocket, and which would give a certain amount of brilliant light again whenever one wished, and could find a little water, into which to put it. It was really, therefore, a case of storage of electricity in an extremely convenient form; and, bearing in mind that the really serious difficulty in electric lighting was the idle hours to which Professor Lewes had alluded, it appeared to him (the Chairman) not at all improbable that, after all, the best way of utilizing electricity would be to convert it into a light something like that which had been exhibited.

The vote of thanks was carried unanimously.

Professor Lewes subsequently showed some further experiments illustrative of what he had brought forward.

Ignition of Gas by an Electric Tramcar.—A workman in Chicago recently made an excavation between the tramway metals in a main street, with a view to repairing a leaking gas service. On the approach of a car, the man raised himself from the hole. The sparks from the brushes of the electro-motor ignited the gas which had accumulated; and the flame shot up 10 feet—happily without inflicting injury on anyone.

Patents in 1894.—In an article contributed to the *Law Journal*, it is stated that the number of patents applied for last year was 25,372—an increase of about 250 over the preceding year. Omitting parts of 100, the figures since 1885 are as follows—the first figure after the date of the year representing applications and the second the number of successful oppositions: 1886, 17,100, 46; 1887, 18,000, 83; 1888, 19,100, 54; 1889, 21,000, 28; 1890, 21,300, 36; 1891, 22,800, 34; 1892, 24,100, 16; 1893, 25,100, 29; 1894, 25,300. As a rule, some 46 per cent. of the total applications are completed; and, though the increase in the number of applications was not so great in 1894 as in former years, it will prove that the number of completed applications will be beyond the average.

An Unusual Pipe-Laying Undertaking has recently been completed in Detroit, Mich. According to information obtained from a local paper, the pipe is to form part of a line by which gas will be brought into Detroit from the Canadian side of the river. The pipe is stated to have been coupled up in 600-feet sections on a launching-way about 600 feet long. From the nose of the first section, a heavy cable was taken across the river, passed through a block, and then attached to a locomotive. The first section was pulled out into the river without difficulty; but five locomotives failed to start the pipe again after the second section was attached. Finally, the nose was raise by grapples lowered from boats; and after the pipe was freed in this way, four locomotives had no trouble in pulling it along. After this experience, the pipe was kept suspended until it reached the Canadian shore, which was upwards of half a mile from the launching-way.

REGISTER OF PATENTS.

Prepayment Gas-Meters.—Cowan, W., of Edinburgh. No. 24,490; Dec. 20, 1893.

This invention, relating to prepayment gas-meters, has for its object to provide an improved application of the eccentric (for the purpose of actuating the coin-carrier and pawl attached thereto) described in patent No. 8444 of 1891. The proposal is to dispense with the use of a separate coin-carrier, and substitute for it a coin-slot carrier or pocket forming part of the eccentric box or track, and attach to the box or track the pawl which actuates the prepayment wheel hitherto attached to the separate coin-carrier.

Fig 1

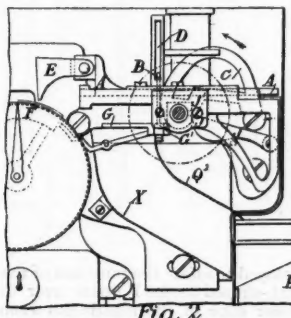


Fig. 3

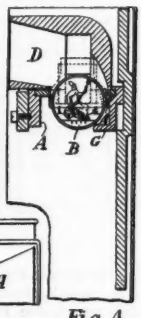


Fig. 2

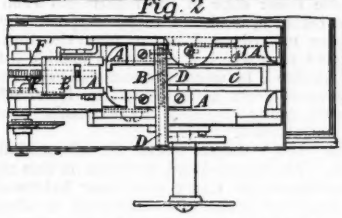


Fig. 4

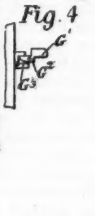


Fig. 1 is an elevation of part of an index-box, showing these improvements attached. Fig. 2 is a plan. Fig. 3 is a cross section. Fig. 4 is a detail view.

The patentee increases the length of the eccentric box or track A at one of its ends, to such an extent as to make the presence of a coin B to be necessary before the box can be operated in a forward direction by the movement of the eccentric tongue or lever C. The box A works longitudinally in guides; and it is provided with a coin-slot or pocket D formed at right angles thereto (as shown), so as to allow of the lever C operating on the side or front of the coin, which thus forms practically the end of the box, and so by its presence enables the box to be moved forward by the action of the tongue C. Or, if desired, the coin-slot may be formed in line with the box, in such a manner as to permit of the tongue C acting on the edge of the coin. In either case, the pocket D is formed with an opening in the end next to the box A, so that the tongue C in moving will press against the coin if present in the slot, and so cause the pawl E, which is pivoted to the front end of A, A, to actuate the prepayment wheel F and mechanism. If no coin be present in the slot, and the tongue be operated, no forward movement will be given to either the box A or pawl E, as the tongue C will simply revolve within the box, and do nothing.

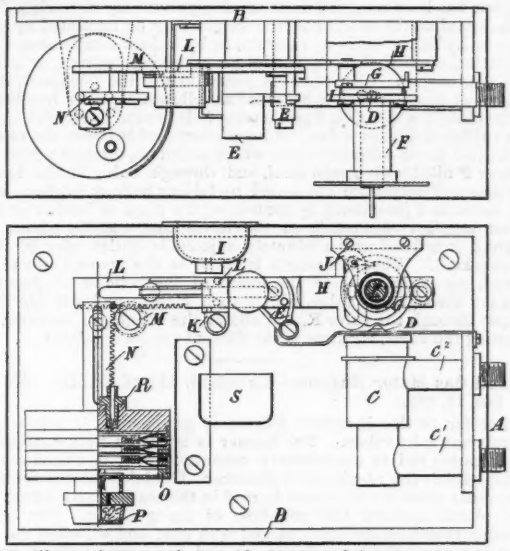
In order to prevent a coin from being dropped before a complete advance of the pawl has been effected, there is a guide with a suitable pin or support G, so arranged that it remains under the coin till nearly the end of its forward journey, which, after passing the end of the support, drops into the money-box H, by means of the shoot X.

When employing the extra shoot Q^2, for the purpose of returning small and surplus coins to the consumer, as described in patent No. 18,141 of 1891, the arrangement of the movable guard or support portion for returning the surplus coins inserted after the prepayment pointer has reached a predetermined position on the prepayment dial, is modified as follows: The portion of the guard or support G immediately underneath the normal position of the carrier's slot D is formed as a hinged or movable portion G^1, having a tail-piece G^2 (fig. 4), with which the forked end of a pivoted lever G^3 engages. The other end of this lever is shaped as shown, so as to permit of a pin on the side of the prepayment wheel F or plain wheel F^1 actuating the lever G^3, so as to depress the tail portion G^2, and force up the moveable portion G^1 out of the path of the coin. If now a coin be put in, it falls through the slot D, and down the extra shoot Q^2 on to the top of the coin-box H. This extra shoot also enables small coins to be returned to the consumer, as they simply fall past the guard G^1 when in its normal position, owing to it being made of the right size to retain the proper, and no smaller, coin.

When employing the foregoing arrangement of eccentric carrier A and tongue C, the patentee prefers to provide the tongue C with a normal support, consisting of a pivoted lever J, the front end of which supports the pin of the tongue's shaft. The lever J is itself retained in its normal position by means of a stationary pin. The lever J also prevents the tongue C being turned in any other direction than that shown by the arrow, as well as acting as a support for retaining the tongue in its normal position as shown, so that, after a coin has been inserted, the pressure of the tongue on the coin may be at once applied.

Supplying Gas on Prepayment.—Thorp, T., of Whitefield, Marsh, T. G, of Manchester, and Haynes, J., of Liverpool. No. 148; Jan. 3, 1894.

This invention relates to apparatus for supplying gas at a predetermined rate per hour, for a predetermined time after the gas supply has been started by means of a coin of prearranged value inserted into the apparatus, and acted on by mechanism operated from the outside of the apparatus; the apparatus being intended for supplying gas-fires in hotel bedrooms, and similar purposes where a temporary supply of gas is required.



In the illustrations are shown a front view of the arrangement partly in section, with the front of the casing removed, and a plan with the top of the casing removed.

In the case A (which is fitted with a door and lock), there is fixed a plate B, formed with lugs for attaching the various parts of the mechanism thereto. To one lug is fixed a chamber C, having a gas-inlet branch C^1 and an outlet branch C^2, and inside is a valve controlling the passage from the inlet to the outlet branch. These branches protrude through the case. The inlet is joined to the gas-supply piping, while the outlet branch is connected to the burner (for instance) of a gas-grate. Between the valve and the inlet, a quantity regulator of any kind may be arranged in the chamber, if desired—allowing a certain quantity of gas to pass through in a fixed time. The valve-spindle D protrudes from the top of the chamber C, and has a circular groove cut in it, into which a spring blade engages, so that the valve is moved up or down with or by the same. The lever is so arranged that, when free, it lifts the valve and opens it; and when depressed into the position shown, it closes the valve. A forked tumbler lever E is fulcrummed as shown; and when in this position, the weighted prong depresses the bent-up end of the spring blade, and holds the valve closed.

Above the valve a shaft F is arranged, supported in a hanging bracket, which has fixed on it at the front end a disc; while the shaft has screwed upon it a wing handle for turning it by. The disc fills an opening in the door of the case; and the wing handle is outside. The shaft F has a disc cam G fixed on it, which is circular in shape, except at the part which is above an inclined projection on the spring blade, when the handle is in the position marked on the disc. The spring blade can then lift and open the valve, when its end is released from the weighted prong of the lever E. The disc G has a single-tooth ratchet-wheel attached to it, into which a pawl J engages, and prevents it being turned in the wrong direction. A crank-pin fixed in the disc G enters a vertical slot in the bar H, which slides on studs passed through slots in H, and screwed into paps of the plate B. It is formed with a lateral projection or driver extending through a slot in a second sliding-bar L—the "drag-bar."

On the top of the casing, a cup I is arranged, with a slot for the insertion of a coin of predetermined value, which coin drops upon an angle-bracket K, fixed between the driver and two pegs on the drag-bar. When the handle and cam-disc G are now turned, the crank-pin moves the slide-bar H to the right, and the coin is nipped between the driver and pegs, so that the drag-bar is moved simultaneously with the sliding-bar. The drag-bar is formed with rack teeth on its lower edge, which gear with a pinion M mounted on a stud; a second pinion on the boss of the first gearing with a vertical rack N, which is guided by a stud passing through a slot in the rack, and has a weight attached to it, which is thus lifted by the movement of the drag-bar. Another peg is fixed in the drag-bar between the prongs of the forked lever E. This peg, as the drag-bar is moved to the right, carries the weighted prong of the tumbler lever over its central position, and causes it to fall over to the right, whereby the spring blade is liberated from the lever C. It is, however, prevented from rising and opening the valve by the edge of the cam-disc G pressing upon a projection until the disc has been turned for an entire revolution.

The drag-bar is, at its end next to the shaft F, formed with a lateral segmental projection. When the shaft has made half a turn, and the crank-pin is on its dead centre, a lateral projection on the cam-disc G passes behind this projection, and holds the drag-bar for part of the revolution of the shaft, while the crank-pin and slide-bar H commence their return stroke. Thus the driver moves back while the pegs remain stationary; and the coin is consequently liberated, and drops into the receptacle S attached to the door of the case or otherwise. By further turning the shaft to its starting position, the slide-bar is returned to its starting-point, and the spring blade liberated from the cam-disc G, so that it rises and opens the valve. Gas then passes through the inlet to the outlet, until the valve is closed again. This is done by the peg on the drag-bar turning the tumbler lever E back over its dead centre, so that it falls into the position shown, and depresses the spring blade when the drag-bar has been returned to its starting position by the descent of the weight. This

causes the wheels to rotate in the reverse direction, and move the drag-bar to the left by means of the rack. On the drag-bar a lateral plate is formed, which passes under the slot in the cup I when the bar is moved to the right, and prevents the insertion of further coins till the drag-bar has been returned to its starting position by the weight.

The speed of the descent of the weight may be regulated by pneumatic or hydraulic brake or cataract, or by a clock escapement, driven by gearing controlled by a pendulum or spring balance, or a fan or friction governor. The patentees prefer to use the pneumatic brake or cataract shown, which is arranged as follows: Upon a bracket cast on the plate B a disc O is fixed, having holes round the centre covered by a rubber or leather valve. A hoop interposed between the disc and the bracket forms a chamber, into which air enters, through a perforated strainer P filled with cotton wool, and through holes in the bracket. The disc and weight are connected by folding bellows leathers, which may be formed (as shown) by connecting flat rings of leather or india-rubber together alternately at the inside and outside edges. The weight disc is fitted with a minutely adjustable outlet-valve R of any suitable kind. When the weight is lifted in the manner already described, air is drawn into the inside of the bellows or pneumatic cataract through the valve, which then closes; and the air slowly escapes through the valve R, and allows the weight to descend. By adjusting the valve, the time of the descent can be regulated.

Oil and Gas Motor Engines.—Campbell, H., of Halifax. No. 778; Jan. 13, 1894.

In so far as this invention relates to gas-engines, it refers to the exhaust and inlet valves. The former is operated by a continuously reciprocating rod in the ordinary manner; but it is placed within a casing outside the compression chamber. The inlet-valve is made with an annular chamber or groove formed in the seating, and with a port-hole placed opposite the port-hole of the gas-inlet. The annular chamber therefore becomes charged with gas; and so, when the inlet-valve is opened, the atmospheric air and gas become mixed, and are free to enter the compression chamber, when a vacuum is formed within the cylinder by the action of the piston.

For large engines, the object of the invention is to utilize the spent gases after they have been used for forcing back the piston. To do this, another cylinder is employed in conjunction with the ordinary working cylinder; the second cylinder being of much larger capacity than the ordinary one. The crank-shaft in this case is a double one; and the crank in connection with the large cylinder will "lead," or be a little in advance of, the crank which works the piston of the ordinary cylinder. Therefore when the spent gases enter into the additional cylinder, the pressure will act upon the additional piston, and so help on the work of the engine. The additional cylinder is made with an exhaust-valve, through which the spent gases, after being twice used, can escape.

Employing Air with Gas for Lighting and Heating Purposes.—Hancock, D., Craig, J. B., and Hancock, A. R., of Stratford, Essex. No. 1238; Jan. 19, 1894.

This invention more particularly applies when the gaseous mixture is used in producing incandescent gas lighting; the object being to dispense with the necessity of introducing air at the burner (and thus reducing the pressure of the gas). Instead thereof the air is carburetted at a pressure or mixed with gas, at any convenient distance from the burner. The burners employed differ from those hitherto used for coal gas incandescent lighting or for heating, in that air is not admitted at the burner, and can be burnt at any desired pressure.

Fig. 1. Fig 2.

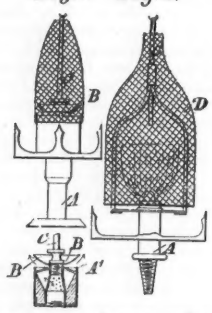


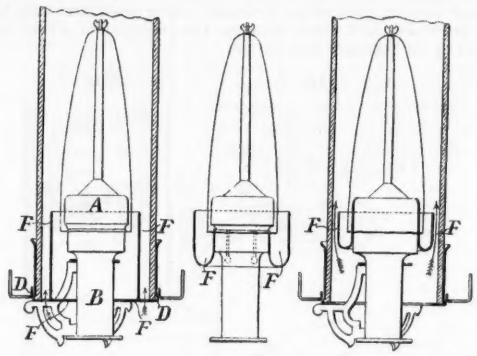
Fig. 1 is an elevation of a ring burner and a vertical section of the nozzle portion. Fig. 2 shows in elevation the application of a so-called batswing or fishtail burner to the purposes of incandescent lighting and heating.

The ring-burner fig. 1 is somewhat similar to an Argand burner, but closed at the centre part. A is the carburetted air or gas supply tube; A^1 being an annular perforated or gauze cover above which combustion takes place. B is a cone or disc fixed at a distance above the ring or burner to act as a spreader for the flame. It is carried on the vertical rod or support C, from which latter a gauze cap or mantle D is suspended. It is to be observed that, with burners thus constructed, there is no central air supply, and outer atmospheric air is not admitted into the burner.

For heating and other purposes, ordinary burners may be employed, like that shown in fig. 2, where a burner of the batswing or fishtail type is applied. A is the supply-tube; D is the mantle; C is the central support, carried by the lateral arms C^1 C^1, and adjustable thereon. E is a base plate supporting the lateral arms, and around which the base of the mantle fits.

Incandescent Lamps or Burners.—Tee, H., of Liverpool. No. 1605; Jan. 25, 1894.

This invention in incandescent gas-lamps has for its primary object to provide such improvements as shall "give to the mantle or hood a longer life than those at present have." The patentee says that, in lamps with a central Bunsen burner and a chimney or cylindrical part about the burner head, it is found that damage, commencing at the lower edge, is caused to the mantle or hood, and its shape and size altered, and life shortened. According to this invention, the defect is obviated by so making the burner as to preclude air from acting on the lower edge; and thus the mantles give "practically the same light after they have been used a considerable time as they do when new, per unit of gas used."



In fig. 1, the means employed to effect the purposes of the invention consist of an annular trough-shaped device F fitting over the burner-head, within which the lower edge of the mantle lies when in place. The device F, in this instance, is shown to be supported by its upper edge being turned over inwards, and resting upon the upper rounded edge of the burner-head, over which it is adapted to slide with an easy fit. Air enters the device F between its outer wall and the chimney, and is therefore prevented from acting upon the lower edge of the mantle; and this edge, being disposed in the annular space within the device, remains undisturbed.

In fig. 2 an annular trough-shaped device F, substantially similar to fig. 1, is employed. The burner-head, however, in this case, is one having different diameters at the upper and lower halves—the lower half being smaller than the upper. The device F is adapted to fit closely and press upon the lower part of the head; acting as a spring frictional clip inwards, by its inner wall being provided with slots or cuts, as shown.

In fig. 3, the means of effecting the purposes of this invention consist of closing the lower end of the burner, between the chimney and tube B, by a structure F, consisting of a vertical ring, and a horizontal plate; the horizontal plate extending in annular form from the tube B to the vertical ring, the upper edge of which projects above the lower edge of the mantle, and which edge lies within the space between the burner-head A and the plate. Thus the space between the vertical ring and the burner is a closed one, except at its upper edge. The lower part of F. is practically an extension of the lower part of the gallery D, inwards, to the tube B; air being admitted to the chimney by holes in the bottom of the gallery, as shown, into the annular space between the vertical ring of F and the chimney.

Making the Joints of Stoves and other Tin and Iron Ware Articles.—Wright, J. W. B., and Randle, W., of Birmingham. No. 2433; Feb. 3, 1894.

This invention consists in uniting the plates of sheet metal together by means of a "double wire edge," as it is usually understood in the trade. The smaller edge is closed, or partly so; the other, the larger edge, is left partly open, and is sufficiently large to allow of the smaller edge of another plate being slipped inside it, thus forming "a close, firm, and bold joint." The joints may either be left circular, or the edges may be afterwards flattened, as preferred; or they may form a square or other shaped joint.

Charging Inclined Gas-Retorts.—Graham, Maurice, of Leadenhall Street, E.C. No. 2937; Feb. 10, 1894.

This invention refers to the measuring chambers which form part of the charging apparatus usually employed with inclined retorts. These are divided (the patentee remarks) into three or more classes, and have top and bottom doors, slides, or valves provided, which work as follows: 1. The latter may be connected together by means of a lever or levers, and travel in opposite directions—*i.e.*, when the top door is open, the bottom one is shut, and *vice versâ*. 2. The slides, &c., are not connected, but are worked independently of one another, by means of two or more handles or levers. 3. It is necessary sometimes, especially when moveable trucks or waggons are used, to only have one door, slide, valve, or the like at the lower end.

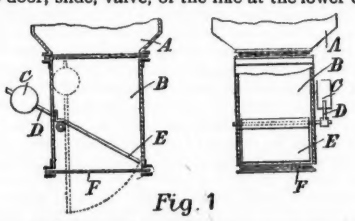


Fig. 1

Fig. 1 is a longitudinal section and part transverse section and part in elevation of a single falling flap apparatus. Fig. 2 is a similar view of a double falling flap apparatus.

The present improvement consists in inserting one or more moveable plates or falling flaps E in the lower half of the measuring chamber B below the storage tank A, just above the bottom slide F. This plate or falling flaps E, work on a pivot, or hinge fixed to one or more of the falling flaps E of the tank or chamber B in any con-

venient manner, and provided with a weighted lever D and weight C, or else a spring balance. The object of this is to prevent the coal falling from the chamber B before the slide F is full open; and, at the same time, to prevent the slide being shut before the whole of the material has fallen from the chamber. This is effected in the following manner: When the coal is deposited in the chamber B, the weight of it resting on the plate or flap E presses it down upon the slide or valve underneath; at the same time covering up the whole opening. Directly the door is full open, the flap falls, and allows the material to flow out of the chamber B. The flap E also acts as a stop to prevent the slide from being shut while the coal is dropping.

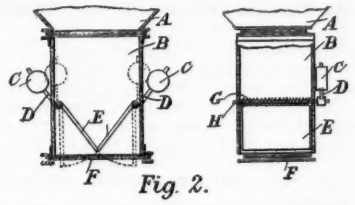
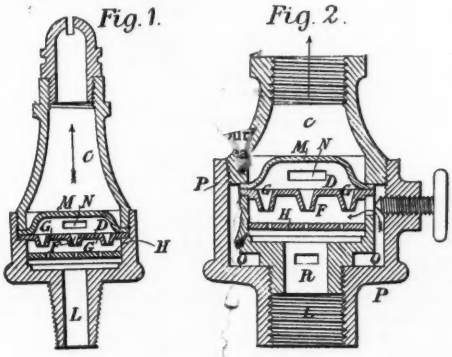


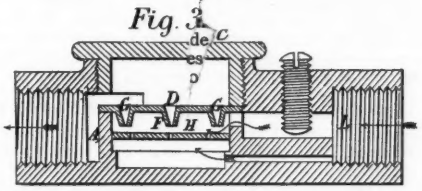
Fig. 2.

In fig. 2 there is a spiral spring G, on an axle H or bar, with or without a weight C or lever D. Directly the coal has run out of the chamber, the weighted lever or the spring—which may be both attached directly or indirectly to the centre axle H, upon which this moveable plate works—immediately raises the latter. The slide F can then be pushed back, and the bottom of the chamber again closed, for a fresh supply of material to be run in ready for the next charge.

Gas-Governors.—Peebles, D. Bruce, of Edinburgh. No. 3068; Feb. 13, 1894.

This invention has for its object to simplify the construction of gas-governors; and it comprises "modifications for upward flow and suitable for one or more burners according to size, together with a modification for downward flow, and which will allow of the governor parts being removed for examination or other purpose, without disconnecting the pendent or other gas-pipe."

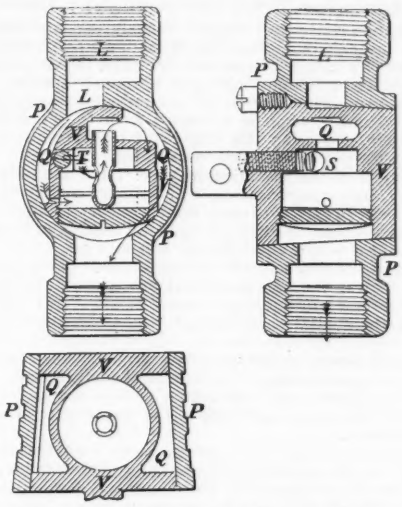




The upward-flow governor, shown in fig. 1, comprises a cylindrical chamber up through which the gas has to pass to the burner, and which is provided with a screwing-in cover C, adapted to receive the burner (or it might be a pipe leading to one or more burners). At the upper part of the chamber, there is held in place by the cover—when screwed in—a disc D, having a central downwardly projecting nipple F, perforated for the gas to pass up through it. The disc is also formed with three or more other nipples or depressions G, projecting down exactly to the same extent as the central nipple F, and being, by preference, similarly perforated. Beneath the disc D (held as described) there is a floating disc H, fitting the cylindrical chamber, but loose enough to move up and down freely; and this disc has small holes of suitable sizes for the passage of the gas through it. It has also a very small hole at its centre, so that some gas may pass through the central nipple of the upper fixed disc D, even when the floating disc H is close up to the nipple. The gas from the bottom inlet L bears up the floating disc in a manner to make it close the nipple openings F and G more or less, according as the pressure is greater or less. Above the fixed disc there is held a dome-shaped shell M, made with one or more lateral slits or openings N.

In the modification shown in fig. 2, which is also for an upward flow of gas, the cylindrical chamber is contained in another casing P, large enough to leave an annular passage Q between it and the chamber. This main chamber is fixed by having its bottom part screwed into the bottom inlet L of the casing P, into the upper part of which also the cover C is screwed, so as to hold the disc D in place. The gas enters by the bottom inlet L, and acts on the floating disc H as already described; and it also enters the annular space Q by one or more lateral openings R beneath the disc, whence it has access to the nipple openings F and G by a lateral opening in the upper part of the cylindrical chamber—this opening being controllable by a screw plug.

In the modification shown in fig. 3, the main chamber is formed in a casing which is elongated; and the entrance and exit passages for the gas are horizontal. The gas enters at L, which in this case is divided by a partition—the lower passage leading to the space beneath the floating disc H, while the upper passage leads by an opening, controllable by a screw plug, to the space between the discs D and H.



In the modification for downward flow, shown above, there is a cylindrical chamber—having in it a floating disc H; and the inlet gas has access, by the passage L, to the space below the floating disc. The inlet gas has also access, by the passage L and hole S (which can be regulated by a screw plug T), to the upper side of the floating disc, whence it finds its way by lateral openings into a tube fixed centrally to the floating disc. The tube, the bottom of which is closed, extends up through a central hole in the top of the main chamber; and when in its highest position, its upper end, which is open, closes up against the horizontal surface shown. The bottom of the chamber is closed by a screw plug. These governor details are contained in a piece V, made with outer ground conical parts fitting tightly in a ground conical socket, formed in a vertical body-piece P, which has its upper end adapted for being fixed to the upper part of a pendent gas-pipe; its lower end being adapted for having fixed to it a continuation of the gas-pipe. The governor-piece V is made with external depressions, which, when the piece is fixed in the body-piece P, form passages Q, from the inlet L to the governor, and from the governor to the outlet. It is an advantageous feature of this construction that the passage for the gas through the governor is very short. The governor-piece V can be fixed in the body-piece with a single screw; and it may be made with a projection to take hold of, to facilitate its removal.

Gas and Oil Motor Engines.—Southall, J., of Worcester. No. 5493; March 16, 1894.

This invention relates to gas or oil motor engines, the supply and exhaust valves of which are similar to those described in patent No. 1203 of 1892. Here, however, the pressure stored up to lift the valve for exhaust is released by means of a passage, which is uncovered to the atmosphere by the piston as it approaches the end of its instroke. The pressure to lift the valve may also be obtained by putting a space (by means of a passage uncovered by the piston, as it approaches the end of its power outstroke) in connection with the pressure existing in the cylinder at such time. A non-return valve in the passage prevents the pressure escaping until released by the passage opened to the atmosphere by the piston, as it approaches the end of its next instroke.

The ignition of the charge is performed by admitting, at the proper times, a portion of the compressed charge either to a tube heated by a Bunsen gas-flame, or direct to a flame burning in a chamber, which is closed up at the time of ignition, but is open to the atmosphere (to support its combustion) during another portion of the cycle. This flame is either a gas or oil-lamp flame; and the heat therefrom can be utilized to heat the vaporizer. A master-light is also advantageously kept burning, to relight the flame if by chance it becomes extinguished. If a gas-flame is used, the patentee prefers to arrange the ignition apparatus in such a way that the pressure of the gas which supplies the flame is kept, during the time the connection is open from the cylinder thereto, about equal to the pressure existing in the cylinder, by forming the burner for the flame on a piston which, when moved, causes a check-valve in its gas-supply pipe to close and compress the gas enclosed between it and the piston, and raise the pressure to the desired extent. This arrangement provides for making an oil-engine which has its ignition and the heating of its vaporizer performed by ordinary gas, or an engine in which oil only is used, without the aid of any separate pump, blower, or fan.

Gas and Oil Engines.—Thomson, F. W., and Yates, A., both of Luddenden, and Binns, J. P. and H. G., of Halifax. No. 5843; March 21, 1894.

The patentees propose to employ what they call a "jackal" governor, which moves on two centre points, when the speed of the engine is too high. The governor is very similar to the pendulum governor; being so constructed that the thrust of opening the valve does not come against the centre points, but a separate piece is attached to the governor capable of being moved backwards and forwards to take the thrust when opening the valve. When the piece is released, a spring brings it into its former position, so that the governor can move freely. The invention further consists in the use of a chamber for the exhaust mixture, surrounded by a water jacket placed in the circuit between

the cylinder jacket and the water tank, thereby keeping the water in the engine jacket more uniform and giving higher efficiency to the engine.

Analyzing Gas and Gaseous Mixtures.—Uehling, E. A., and Steinbart, A., of Birmingham, U.S.A. No. 9049; May 7, 1894.

This invention relates to a method of analyzing gases and determining a constituent thereof, consisting in continuously passing the gas to be analyzed, by means of constant pressure, through an absorption chamber having a minute inlet and a minute aperture, and then abstracting the constituent from the gas during its passage through the absorption chamber, whereby a change from the normal tension is caused therein, and using this change of tension as a measure for determining the percentage of the constituent.

The principle of the invention may be stated thus: If a tube be divided into three compartments, by partitions containing very small apertures, and one of the exterior compartments be filled with gas of a higher tension than the other, and if the tension in both compartments remains constant, the following will take place: The gas of the higher tension will flow towards the compartment of the lower tension, passing on its way through the central compartment, in which it will assume a constant tension—the "normal tension." If now a part of the gas in the central compartment is continuously taken away, a change of tension will take place in this compartment, which change of tension will depend on the quantity removed. Again, if the specific gravity of the gas be changed in the central compartment, the tension will be also affected; and the degree of this change of tension is dependent on the degree of change of the specific gravity of the gas in the compartment.

These facts are utilized in the present invention in that the patentees employ the central compartment as an absorption chamber, into which the gas of the first compartment (with constant tension) continuously flows, and from which it escapes continuously into the third compartment of lower constant tension. The inlet and the outlet consist of small apertures; and the absorption chamber is connected with an instrument for measuring tension. The specific gravity of the gas is measured, either before entering or after leaving the absorption chamber, by a suitable gravity meter. If a component of gas be taken away continuously by absorption, by means of a suitable reagent introduced into the compartment without affecting the tension, then a change of tension will take place in the absorption tube or chamber, and the quantity of gas corresponding to the change of tension can be read off on a manometer by suitable indices. The form of the indices depends upon the specific gravity of the total gas mixture and the specific gravity of the component absorbed.

Joining Water-Taps and Service-Pipes.—Barker, J., and Handley, T., of Rochdale. No. 15,507; Aug. 15, 1894.

For this joint, the lead pipe is cut square at the end; a brass socket, with a brass nut, is slipped upon the pipe; and the end of the lead pipe is then flanged back on the face of the socket. The water-taps and service connections will be made to fit the brass nut, with a nib to fit into the lead pipe, so as to prevent the bore of the lead pipe being diminished in the operation of flanging. By screwing up the brass nut, the tap is brought down upon the flange of the lead pipe, and as perfect a tight joint is made as though soldered or wiped.

Water-Meters.—Duch, P. C., of Gracia, Spain. No. 17,135; Sept. 8, 1894.

This invention relates to a so-called maximum water-meter—that is to say, a meter by which no amount of water in excess of that for which its appliances are calculated and combined is allowed to pass the apparatus. The improvements relate to—1. The construction and arrangement of the case in which the mechanism is enclosed. 2. The construction and arrangement of the entrance valve for water. 3. The arrangement of the piston and its valve. 4. The arrangement of the turnstile. 5. The arrangement of the clock train. 6. The construction and arrangement of the outlet-valve.

The principal claim is thus stated by the inventor: "In a water-meter, a piston maintained in suspension in the liquid, adapted to descend when the amount of water diminishes and rise when it increases—the said piston having a valve within the piston, which closes itself slowly when the piston descends, and opens rapidly when it rises under the action of a weight, combined with hooks jointed on to the piston; a turnstile adapted to turn while held in suspension in the water, opening or closing its inlet in such a way that in its interior the pressure is constant; and an exit-valve formed with a conical hollow plug adapted to move longitudinally under the action of the piston in a box screwed on to the exit for the water of the meter, in order to attain a constant delivery of the meter under variable pressure."

Water-Meters.—Nash, L. H., of South Norwalk, Conn., U.S.A. No. 19,635; Oct. 16, 1894.

This invention, relating to water-meters, consists of a large number of minor details and combinations of parts not described apart from the drawings accompanying the specification.

Chimney Cylinders for Incandescent Gas-Lights.—Epstein, M., of Stolberg, Germany. No. 19,864; Oct. 18, 1894.

The claim for this invention is for "a cylinder for gas glow-lights consisting of solid or hollow fluted glass rods, star-shaped in section, and engaging with one another like gear-wheels." The patentee contends that, owing to the close connection and continuous engagement of the adjacent glass rods, forming (in consecutive series) the ring of the cylinder-mantle, very great strength is attained.

Manufacturing Bodies which are to be Raised to Incandescence.—Tiegs, A., of Berlin. No. 20,735; Oct. 30, 1894.

This invention relates to the manufacturing of bodies which are to be raised to a state of incandescence, so as to "give an intense light, which may be either absolutely white or coloured as desired." In carrying the invention into effect, a salt of lime—such as the carbonate—is subjected to the action of hydrochloric acid; and to the resulting liquid a solution of ammonia may be added. Absorbent materials are impregnated with the solution, and calcined or burned; and the remains of the impregnated materials are then capable of assuming a state of incandescence, and giving an intense white light. Other substances containing lime which may be used, instead of pure carbonate, are the shells of crustacea, and the like; and instead of hydrochloric acid, any other acid capable of dissolving lime may be employed. Further, the saturated solution obtained may be diluted by an equal quantity of water, without losing its valuable properties; and any suitable colour may be given to the light emitted by the addition of suitable salts.

Atmospheric Gas-Burners.—Fletcher, T., and Russell, W., of Warrington. No. 22,231; Nov. 17, 1894.

This invention relates to the burners used in gas-fires; and its objects are "to prevent lighting back and the explosions which sometimes occur in the burner when the gas is lighted or extinguished." This is attained by arranging in the chamber below the burner nozzles a number of narrow passages, through which the gas is compelled to pass on its way from the mixing-tube to the nozzles.

Fig. 1 is a plan and an inverted plan, and fig. 2 a cross section of one form of the burner. Figs. 3 and 4 are a cross section and plan of a modified form of the burner.

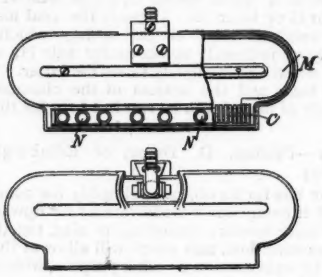
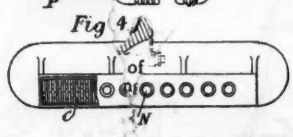


Fig. 1



The narrow passages through which the gas and air must pass are formed by threading larger and smaller washers or centrally perforated metal discs upon a light rod or wire; one of the smaller washers or discs being arranged between each pair of larger discs, as shown. Or the passages may be formed by turning them out of a rod, by casting, or other suitable process. Between the mixing-tube M and the nozzle N, the narrow passages are contained in a chamber or cavity C, into which the nozzles open, and which communicates with the mixing-tube through a port or passage P. As shown by figs. 1 and 2, the whole burner is constructed in a single plane. In the modification represented by figs. 3 and 4, the chamber C containing the passages is arranged above the mixing-tube M. In other respects the burners are constructed in the usual manner.

APPLICATIONS FOR LETTERS PATENT.

16.—Schofield, S., "Enriching coal gas." Jan. 1.

104.—Yeadon, J. A., and Adgie, W., "Revolving retorts." Jan. 2.

120.—Cannell-Bunn, P., "Incandescence bodies for illuminating purposes." Jan. 2.

129.—Tervet, R., jun., "Extracting sulphur and other substances." Jan. 2.

135.—Surry-Montant, A., and Llohammer, F. J., "Composition for the mantles and similar bodies used in incandescent lighting with gas and other flames." Jan. 2.

147.—Ross, J. S., and Whenman, G., "Pipe-joints." Jan. 2.

189.—Eves, J. V., O'Brien, W. D., and O'Brien, L. F., "Apparatus or appliances heated by gas." Jan. 3.

255.—M'Neill, D. R., "Adjustable jet nozzles or valves for combustible gas or other fluid." Jan. 4.

347.—Humphrey, H. A., "Gas or oil motor engines." Jan. 5.

412.—White, W., and Wallace, J. A., "Automatically lighting and extinguishing street and other gas-lamps." Jan. 7.

435.—Thomas, T. C. J., "Lamps for overhead lighting." Jan. 7.

475.—Hoefling, C. E., "Chimney for Argand and incandescent gas-burners and other lamps." Jan. 8.

528.—Pinchbeck, J., "Coin mechanism for the supply of gas in given quantities." Jan. 8.

546.—Niemczik, A., "Ignition and gas-generating body for explosive engines rendered incandescent by an electric current." Jan. 9.

601.—Russell, W., Clare, A., and Messrs. Fletcher, Russell, & Co., Ltd., "Linings and shelf-carriers for gas-ovens." Jan. 10.

602.—Russell, W., Clare, A., and Messrs. Fletcher, Russell, & Co., Ltd., "Hot-plate grids for gas cooking apparatus." Jan. 10.

628.—Johnson, S. A., "Employment of hydrocarbon or other suitable oils for heating, cooking, and similar purposes." Jan. 10.

660.—Gröbbels, P., "Igniting apparatus for gas-lamps." Jan. 10.

682.—Picken, W. B., "Gas-burner." Jan. 11.

756.—Blum, J., "Manufacture of producer and other combustible gas." Jan. 11.

804.—Riemann, C., and Stoldt, C., "Lighting and heating apparatus." Jan. 12.

811.—Arendt, M., "Mantles for incandescence gas-burners." Jan. 12.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

Professor Lewes on "The Commercial Synthesis of Illuminating Hydrocarbons."

SIR,—Unless I am greatly mistaken, the lecture delivered by Professor Lewes at the Society of Arts, last Wednesday night, on "The Commercial Synthesis of Illuminating Hydrocarbons," will mark an epoch in the history of gas lighting. With the realization of the synthetical production of acetylene on a commercial scale, and at a cost which does not render its application absolutely prohibitive, the art of illuminating by means of coal gas has taken a vast stride both forward and upward.

If coal gas lighting was ever in any serious danger of being superseded by other methods of illumination (which, however, I have never seen reason to admit), the fear of any such event may now at once be put aside. The tables are, in fact, turned. It is the other illuminants and modes of illumination whose interests are now imperilled.

The important part which is played by acetylene in ordinary illuminating gas has never been fully realized. Although present therein in but very small proportion—probably to the extent of not more than 1 or 1½ per cent.—it is to this valuable hydrocarbon that the illuminating qualities of coal gas are mainly due.

I remember when, some years ago, the question of high heats in the retorts was being discussed, the opinion generally expressed and held was that under high (or what were described as excessive) temperatures, whilst a larger production of gas per ton of coal was obtained, it was at the sacrifice of the illuminating value. This view was controverted by Mr. William Carr at that time, as being contrary to his experience—the larger production of gas in his working being accompanied by an increased illuminating power; and he suggested, with rare wisdom and foresight, that this effect was probably due to a reconstitution of the hydrocarbons under the high heats, resulting in the formation of acetylene. It will probably turn out that this view was the correct one. It is necessary to observe, however, that the conditions referred to can only arise in the larger yield of gas due to the high temperature, and not to any large yield obtained at a lower temperature, by means of a prolonged or wire-drawn charge.

On the 27th of December last I had the pleasure of carefully examining and testing a sample of the calcic carbide (built up by synthesis as described by Professor Lewes) which was sent to me for that purpose. My observations generally coincide with those of the Professor. On placing a small piece of the compound in a flask—through the india-rubber stopper of which I had previously arranged a funnel tube for applying the water, and another tube having a No. 0 fishtail burner fitted thereto—and pouring a little water upon it, the acetylene gas was produced with great rapidity. The flame at the small burner was about an inch long, and an inch across at the widest part. It was of the most beautiful description, of a pure brilliancy, and almost as white as driven snow, with an entire absence of blackness at the point of issue from the burner—due, as I apprehend, to the presence of a small proportion of oxygen coming off and mixing with the acetylene. High as was its illuminating power, the flame had not that concentrated brilliancy—amounting to oppression—seen in the electric arc light, but a softer radiance, as though quantity rather than intensity of light was being evolved. In a word, there is evidently in this acetylene flame great diffusive power with high illuminating power combined. The comparatively low temperature of the flame is one of its most striking features. I was able to hold my hand over it with impunity at a distance of not more than 3 inches.

From the observations I have made, I am convinced that Professor Lewes is working on the right lines; and he is fortunate in being the exponent of, and acting as sponsor for, this new and powerful enricher. Coal gas (not water gas) must be the carrying medium for the hydrocarbon. The new enricher will not add to the difficulty of consuming the gas. It not only does not increase, but it reduces the proportion of objectionable products of combustion. It is not accompanied by any production of carbon monoxide, present in such serious quantity in carburetted water gas. The temperature of the flame is reduced as already stated.

Along with these obvious advantages, a low-grade gas may be produced, if thought desirable, for purposes other than lighting; and enrichment may be applied at or near to the meter. A wider choice of coal for the gas maker's purposes will thus be available; whilst there is practically no limit to the supply of the raw materials from which the calcic carbide can be produced.

THOMAS NEWBIGGING.

5, *Norfolk Street, Manchester,*
Jan. 19, 1895.

SIR,—I have no doubt that many of the gentlemen interested in the good or bad fortunes of the gas industry who were present at Professor Lewes's brilliant lecture at the Society of Arts on Wednesday evening last must have been deeply impressed by the high hopes held out by the lecturer of the great value of acetylene as an enricher of coal gas. Professor Lewes is reported to have said, as I certainly understood him to say, "I am *desirous* of *understating* rather than overstating the powers of acetylene; so that, instead of taking enrichment values for it, which might be questioned, *I prefer to simply take the illuminating power of the gas when burned 'per se,'* and the light measured in the photometer, which, as before stated, is 240 candles; whilst, for the same reason, we will take the claimed enrichment value of the Young gas instead of its photometric value." The italics are mine.

The only inference I could draw from the Professor's words (which, by the way, astonished me very much) was that the specific luminosity of acetylene gas, when mixed with weaker gases, would be even *greater* than its specific luminosity of 240 candles when burned in the pure state. The learned Professor, however, in reply to my question, with much candour and equal courtesy informed the meeting that acetylene, when mixed with coal gas in small proportions, only had a value of 1·5 candles per 1 per cent., instead of the 2·4 candles when burned in the pure state—a lesser value, and not a greater value, than his words would induce one to believe. I hope it may not be out of place to suggest that the paragraph in question should be so expressed as to contain no suggestion that the enrichment result would be higher than that which might be inferred from its value when pure.

Accepting the value admitted in the reply to my question—a value that I venture to predict may not be reached in practice—then there are, on the grounds of economy, no apparent advantages in the use of acetylene over other hydrocarbons occurring in the natural state; and it has no other interest to the gas manufacturer than as a competitor, which it will be if what is stated on its behalf as an illuminant *per se* be justified by further experience. For instance, taking the data furnished at the meeting, 11,000 cubic feet of 150-candle gas (as an enricher) give 330,000 candles per ton at £3 10s. It is *claimed* for a ton of oil that it yields 22,000 cubic feet of gas of 96 candles, or 422,000 candles per ton.

LEWIS T. WRIGHT.

1, *Victoria Street, Westminster, S.W.,*
Jan. 19, 1895.

SIR,—I would desire, in the interests of your many readers and the investing public in particular, to be permitted to make some remarks upon the subject-matter of Professor Lewes's lecture on acetylene at the Society of Arts on Wednesday last.

In common with other gas engineers who were present, I cannot but admire the beautiful simplicity of this process of synthetically making calcium carbide by the aid of our modern benefactor electricity; for, as a chemical triumph, it may almost be said to be complete, and holds out a glorious future for the further developments of electro-chemistry. It is not, however, my intention in this letter to deal with the chemical side of the question, as that can be left in far more competent hands. It is with the pounds, shillings, and pence, or commercial, side of the matter that we are chiefly concerned; for, however beautiful and surprising discoveries of this character may be, their capability of adaptation to the every-day requirements of mankind alone renders them of utility.

As I will endeavour to show in the latter part of this letter, Professor Lewes, though giving colour to the statements made as to the cost of production of this interesting material, did but little to cheer the hopes of either the gas or the electrical communities. This cost was stated to be as follows:—

	Net Cost of Producing 2000 lbs. of Calcium Carbide.		Percentage Cost.*
1200 lbs. of coal dust (say)	$2·50	..	16·70
2000 lbs. of powdered burnt lime . .	4·00	..	26·70
180 electrical horse power from water, at (say) 50 c. per hour for 12 hours .	6·00	..	40·00
Labour, &c.	2·50	..	16·60
Cost of 2000 lbs. calcium carbide (say)	$15·00	..	100·00

*Added by myself.

Further statements by the Professor gave the cost of the material per English ton at £4, or, allowing for the residual products, £3 10s. net; and from this could be produced 11,000 cubic feet of gas having a photometric value of 240 sperm candles.

With a view of permitting comparisons to be made with other forms of popular artificial illuminants, I have prepared the following table; the figures which are derived from my own particular experiences being marked with an asterisk:—

System of Illumination Employed.	Cost per 1000 Cubic Feet.	Cost per 1000 Candles.	Candles per Ton.	Available Candle Power for £3 10s. expended in Horse Power or otherwise.	Available Candle Power for 180 H.P. × 12 Hours.
	s. d.	Pence.			
(1) Electric arc, yielding a light of 2 candles per watt* . . .	..	0·149	..	6,444,000	3,222,000
Carbon renewals	..	0·016	..	..	..
(2) Incandescent lamps, yielding 0·25 candle per watt* . . .	..	1·190	..	805,500	402,750
Lamp renewals at 9d. per 16,000 candle-hours . . .	..	0·560	..	..	..
(3) Acetylene gas, yielding 240 candles per 5 cubic feet . .	6 4½	1·810	530,000	530,000	..
(4) Petroleum oil (Peebles gas) .	3 4	2·000	422,400	..	..
(5) Petroleum oil-lamp, giving 28 candle power for 2 oz. avoir.*	..	2·520	501,760	351,232	..
(6) Ordinary London coal gas, 16-candle power, at 1s. 6d. per 1000 cubic feet	1 6	5 620	33,600	149,333	..

It will be observed that I have in all cases taken the Professor's figures for the cost of the energy in electrical horse power; but it does not need very much perception to see that these figures have evidently become somewhat mixed in their passage across the Atlantic, and might better have remained at home and left us to expend an equivalent amount of cash on this side of the "Herring Pond" to better advantage somewhat as follows: Consume £3 10s. worth of good gas coke (say) at a cost of 10s. per ton, and, in accordance with the experiments of Mr. Emerson Dowson, which have been duly chronicled in your columns, we could get an available horse power for every 2 lbs. by weight of the fuel, or a total of 7860 electrical horse power as against the (180 × 12) 2160 taken from this so-called cheap water, which would produce theoretically the following results by electrical illumination:—

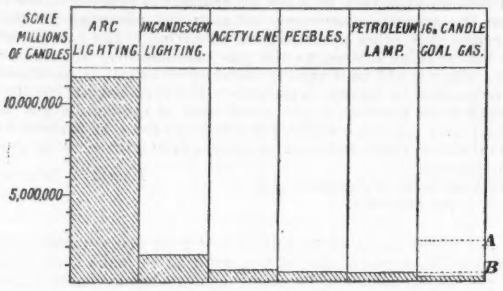
		Ratios.
Electric arc lamp . about	11,690,000 candle-hours	= 8 : 1
Electric incandescent lamps	1,461,800 ,,	= 121 : 44
Acetylene gas only showing	530,000 ,,	

In answer to my question as to the relative candle power produced in available light from the energy put into calcium carbide as compared with electric light, the worthy Professor was understood to put the ratio as 28 : 44; the former representing a favourable statement of the value of incandescent electric lighting as compared with this gas

acetylene. May I, therefore, ask the Professor to put me right, or otherwise explain what he intended to make understood?

21, *Old Queen Street, Westminster, S.W.*, FRANK WRIGHT.
Jan. 19, 1895.

Diagram Indicating the Theoretical Efficiencies of Various Illuminants.



NOTE.—If the gas be turned into energy to drive a dynamo, the relative development of light by the arc and incandescent electric systems is indicated by the dotted lines A and B (factor 25 cubic feet per horse power.)

Mr. R. Forbes Carpenter on the Enrichment of Coal Gas.

SIR,—In the abstract of the interesting address of Mr. R. Forbes Carpenter to the Manchester Section of the Society of Chemical Industry published in your issue of the 15th inst., Mr. Carpenter refers to the processes which have come more or less into vogue for increasing the illuminating power of gas; and, among others, he mentions the Peebles process, the Tatham or oxy-oil process, and the carburetted water-gas process. Regarding the latter process, he says: "I learn on the authority of Professor Vivian B. Lewes, that last winter (1893-4) 10 per cent. of the gas supplied by The Gaslight and Coke Company was derived from this source; and the ordinary gas of 14 or 15 candles was enriched with the 22-candle water gas, and sent out at 17 or 17·5 candles to ensure getting the required 16 candles at the testing-stations." At the end of his remarks, he further says: "One drawback to enrichment processes I have not named—the fact that the gas is the carrier of hydrocarbon vapours. This leads to stratification in the gasholders; and when the gas passes along the mains with the friction against the skin of the pipe, tendency to condensation and deposit of liquid hydrocarbons arises; so that, to reach the consumer, gas of proportionately higher candle power must be sent out from the works."

My principal object in writing is to draw attention to the fact that, although what Mr. Carpenter says may be true in regard to the lack of permanency of gas enriched by means of carburetted water gas, it certainly does not apply to the gas enriched by the Peebles process, for the very hydrocarbons which would condense out under the conditions to which he refers are, by that process, produced only in limited quantities, and what are produced are carefully fractionally condensed and washed out of the oil gas, and returned to the retort to be gasified. The enriched gas is therefore perfectly permanent, and will reach the utmost limit of supply.

Anyone reading Mr. Carpenter's remarks regarding the sizes of the flames in relation to their illuminating power, as also the illuminating effect, would be led to infer that an enriched gas must necessarily give a smaller flame per unit of illuminating power than a coal gas of equal value. While it is an undisputed fact that carburetted water gas, as at present manufactured by the Lowe plant, gives a smaller flame per unit of light than ordinary coal gas of like illuminating power, it does not follow as a matter of course that carburetted water gas must necessarily give a smaller flame; and still less does it follow in the case of an enriched coal gas, as the size of the flame is largely dependent upon the constitution of the hydrocarbon employed to give illuminating power to the gas. Thus marsh gas, and all the members of the paraffin group, give a large flame in relation to their illuminating power per unit of area; and therefore, when a gas is carburetted with American gasoline, which consists largely of paraffins, it gives a much larger flame per unit of light than the same gas carburetted with benzol; and the flame would be still smaller if the gas were carburetted at the place of combustion with naphthalene. On the other hand, a gas carburetted with the olefine group of hydrocarbons produces a gas giving a flame of medium-sized area in relation to its illuminating power.

Roughly, it may be stated that, with a given quantity of poor gas, the size of the flame of the enriched gas in relation to the illuminating power will fall as the carbon density of the enriching hydrocarbon increases and the hydrogen density decreases. The same may be roughly said regarding the heating power of the enriched gas. Thus a gas enriched with American gasoline, having a low carbon and a high hydrogen density, will have far more heating power per unit of lighting power than the same gas enriched with benzol.

Carburetted water gas is produced by the Lowe process by decomposing the oil vapours diffused through the water gas by a very large area of highly-heated surfaces—conditions which lead to the cracking up of the oil vapours into free carbon, hydrogen, and marsh gas, and the formation of hydrocarbons having a high carbon and a low hydrogen density, a large proportion of which is liquid at ordinary temperatures, but yet sufficiently volatile to be taken in solution or held in suspension in an exceedingly fine state of division in the water gas. Hence the reason for carburetted water gas giving a small flame in relation to its illuminating power, and also the necessity of allowing for the unavoidable partial deposit of hydrocarbons during distribution through the causes referred to by Mr. Carpenter.

When oils are cracked up at low temperatures and by radiant heat, the wrenching asunder, so to speak, of the molecules of the oil is not so great, and the hydrogen is, to a larger extent, left associated with the carbon. Hence hydrocarbons having a lower carbon and a higher hydrogen density are produced. Although these may not have the same enriching value as the hydrocarbons produced at such high temperatures as obtain in the Lowe process, yet the extra quantity yielded by a given bulk of oil more than compensates for the lower enriching value. Besides being to a large extent hydrocarbons that are gaseous instead of liquid at ordinary temperatures, the enriched gas is more permanent, and has a higher heating value per unit volume—both matters of geat importance.

Peebles, Jan. 17, 1895. WM. YOUNG.

Gas-Fires for Hotel Bedrooms.

SIR,—I have just read the letter of your correspondent Mr. T. O. Paterson, on the above subject, in the JOURNAL for the 15th inst.

I agree with Mr. Paterson that the "*compteur horaire*," as used in Paris, is a very simple means of supplying gas-fires in hotel bedrooms; but this apparatus requires considerable attention, as it is necessary for the time recorded on the dials to be taken, so that the time for which the gas has been burning may be charged for.

I am of opinion that a better way of meeting the case would be by means of an arrangement actuated by a coin, as this would not require so much attention, and would be more profitable to the hotel proprietor.

The "*compteur horaire*," as mentioned by Mr. Paterson—and in which I may say I am interested—is sold for 25 francs; and at a very small additional cost, a coin-freed arrangement could be obtained.

This is a subject well worthy the attention of gas engineers and managers; and I am confident that very little "push" on their part would lead to the adoption of gas-fires in the bedrooms of most of the large hotels of the country.

Manchester, Jan. 19, 1895. T. G. MARSH.

The Detection of Inflammable Gas in Electric Culverts.

SIR,—The numerous explosions which have occurred in electric culverts lead me to draw attention to the necessity of accurate and delicate testing for inflammable gas in the air of these culverts and street-boxes. After a recent explosion of this kind in the Metropolis, careful tests were carried out by Mr. Boverton Redwood's apparatus, which involves the application of the hydrogen flame to gas testing. I have shown that this flame surpasses all others for accurate and delicate gas testing; and I was therefore quite prepared to hear that the presence of 1 per cent. of gas was easily detected by means of this apparatus, when other detectors had failed to find any gas at all.

It does not seem to be generally considered that coal gas is more or less completely deodorized by going through soil, as is shown by the strong smell which it imparts to the soil through which it has passed. It has been said, on good authority, that this loss of smell is in some cases complete. Hence the statement freely made, that coal gas must be absent from the culverts if this gas is not smelt, cannot be held to be conclusive; and it becomes necessary to apply an accurate detector, such as Mr. Redwood's apparatus, in order to establish the fact whether or not gas is present.

It may be added that this hydrogen-flame detector, applied in an ordinary safety-lamp or in the above apparatus, easily shows the presence in the air of a proportion of carbonic oxide or of water gas, which, according to the report of the Prussian Fire-Damp Commission, is below the quantity poisonous to man when inhaled.

Nottingham, Jan. 15, 1895. FRANK CLOWES.

Extinctions of Lights through Water Escaping from Governors.

SIR,—Reading in your lately-received issue the news of the extinction of lights served by one of the leading mains from the Plymouth Gas-Works, the thought came to me, as doubtless it did to others, that the running out of the water from the leading-tank of a gas-governor, either by accident or design, might have been avoided had the governor been adjusted to give the minimum pressure—say, 10-10ths or 12-10ths—when all the water was out of the tank. There is a governor here treated in this fashion; and the benefit of such an adjustment has been appreciated when, by accident, the water has escaped. As for the escape of water by accident, it is of such rare occurrence that I should imagine nothing beyond culpable neglect should be answerable for it. A safety appliance between the leading main to the town and the inlet-main to the gasholders has already appeared in the market.

In alluding to the deprivation of supply, it may be pointed out that it is not only the inconvenience of being deprived of light that is to be considered, but the danger of people leaving lights glimmering, and after the extinction, entering the rooms with a light, and so rendering hasty retirement imminent. Nor should it be overlooked that there may be cases of sickness in the house; and the escape of gas under such circumstances might have serious consequences, owing to the helplessness of the invalid.

Launceston (Tasmania), Dec. 10, 1894. T. S. CLEMINSHAW.

Strains in Gasholder Guide-Framing.

SIR,—With your permission, I will deal with the three objections raised by Mr. F. S. Cripps in the article on the above subject which appeared in the JOURNAL for the 1st inst. (p. 23).

(1) I have not forgotten to multiply by 2; but there is an error, because the wrong angle, 360 : 24, is given instead of the right one, 360 : 48. The resulting pressure is therefore only 5470 kilos., as I stated. I must, however, apologize for having confused $\sin \alpha = 360 : 24$ and $\sin \frac{1}{2}\alpha = 360 : 48$.

(2) The different values of Z are right, because the strains of the girders are only equal to 9780 kilos. Each row of rollers strains one row of girders. The strain of 23,910 kilos. on the lowest parts of the diagonals arises partly from the pressure of the lowest rows of rollers by intermediation of the lower girders, and partly by intermediation of the middle and upper diagonals from the higher rows of rollers and the corresponding girders. I do not see, therefore, how Mr. Cripps finds an error in this case.

(3) Mr. Cripps says I have made no allowance for rivets. This I

can defend, because the introduction of a co-efficient for weakness of junction-points would merely complicate the calculation, which in that case was but of an explanatory character. That the strain for the square unit of area is generally at the points of junction greater than in the full area of the material is commonly known; and the degree of weakness at these points depends very much upon the character of the junction employed. Since the junctions in the Old Kent Road case are not made for the purpose of withstanding the full tension, but only a much smaller one, the agreement of the existing structure with my formula is not so perfect as I assumed, and my formula would need a greater margin of safety than would be the case in real practice. But that is not to be wondered at, because my formula is prepared for a simple case; and the agreement with the case of such complex structures, while indeed it would be very agreeable, cannot be required.

I should like to answer Mr. Cripps's deductions in regard to guide-framings of the type of Mr. Cutler's patent. This could not, however, be done by a few remarks, but would need a number of new suppositions and investigations, that would be somewhat different from those contained in my former article. How many of the diagonals of such framing then come under tension, and how many under thrust, would be ascertained from calculation. By making brief remarks in such complex matters, there arise too much misunderstanding, as shown by the discussion on my first article. In its original form, this was commended by Mr. Cripps; while in the discussion there arises one difference of opinion after the other, because one cannot see exactly what was originally meant by the writer.

Though the reported wrecking of the largest gasholder in America shows how serious a matter gasholder construction is, I do not think that, by the development of new formulæ, I can prevent misuse, by mere copyists and inexperienced people in the erection of gasholders, taking place in some cases here and there. I therefore prefer to let the matter rest for some time, especially as I am now very much engaged in other matters.

Dessau, Jan. 6, 1895. M. NIEMANN.

Another Explosion in an Electric Light Box.—Last Friday afternoon, an explosion occurred at the bottom of St. James's Street, opposite the Thatched House Club. It was accompanied by a loud report; and the iron lid of a manhole was blown some distance into the air, and fell on the footpath. Fortunately, no one was near at the time. The occurrence apparently originated in the electric light mains.

The Gas and Water Works Purchase Question at Ambleside.—At an extraordinary meeting of the Ambleside Urban District Council last Wednesday, it was decided to confirm the resolution of the late Local Board directing the promotion of a Bill for the compulsory purchase of the Gas and Water Company's works. It is understood that there is likely to be an amicable settlement between the Council and the Company.

Gratifying Report on the Working of the Newry Gas Undertaking.—The Gas Committee of the Newry Town Commissioners report that the total receipts for the past year amounted to £7592; and the expenditure, to £4234. The net profit was £1601, which exceeded that of the previous year by £764. A sum of £537 was spent on works during the twelve months in extensions. The Committee also announce a reduction in the price of gas of 5d. per 1000 cubic feet, to take effect upon the quarter's consumption ending Jan. 1, as well as the abolition of all meter-rents for the preceding quarter.

Leeds Corporation Gas Affairs.—The appointment of a successor to the late Mr. Lupton as Superintendent of the Leeds Corporation Gas-Works occupied the attention of the members of the Gas Committee for a considerable time at their meeting last Thursday. Eventually it was decided to advertise the vacancy; the salary offered to be £300 per annum. A resolution was also passed authorizing the purchase of a plot of land adjoining the New Wortley works for storage purposes. Plans were approved for the building of new offices, and store and show rooms at the Meadow Lane station.

'95 Tar Products Sales Committee, Limited.—A joint-stock Company has been formed under the above title, with a capital of £95,000, in £1 shares, "to carry on business as dealers in tar, tar products, and all or any residual or other products obtained in the manufacture thereof; to enter into and adopt any agreement or agreements with any persons and firms or companies, whether members of the Company or not, for the purchase or supply of the same; to buy, or otherwise acquire, sell, dispose of, deal in, get, hold, store, import, export, manipulate, prepare for market, and refine the same; and to carry on the business of warehousemen, brokers, forwarding agents, insurance agents, carriers, and financiers." There are to be not less than three nor more than eight Directors of the Committee. The first are Messrs. Burt, Boulton, and Haywood; Messrs. Forbes, Abbott, and Lennard; Messrs. Robinson Bros., Limited; Messrs. Stainsby and Lyon, Limited; Messrs. Sadler and Co., Limited; Messrs. Hardman and Holden, Limited; Messrs. Bird and Son; and Mr. Alex. Forest.

Serious Explosions of Gas.—An alarming explosion of gas occurred in Violet Street, Halifax, last Tuesday. Several persons were injured, though not seriously; and much damage—roughly estimated at from £500 to £800—was done to property. For several days previously, residents in the street had complained of a strong odour of gas, which was due, it is believed, to the recent thaw having caused the mains to crack. On Tuesday morning, some Corporation workmen opened a portion of the street for the purpose of discovering the leakage. As they proceeded with their search, the smell of gas became more pronounced; and shortly after noon the explosion took place. Seven houses were more or less damaged; and the explosion set fire to the contents. The fire brigade were speedily on the spot; and soon extinguished the flames in the houses, but they could not at first cope with those which rose from the pavement. Nearly two hours are said to have elapsed before the gas could be shut off at the mains. It is supposed that the gas was ignited by the fires in the houses. On the evening of the same day, there was a destructive explosion of gas in Palmerston Street, Beswick, Manchester. This also is attributed to a leakage from the street mains. Three houses were badly damaged; and a young woman was injured, but not seriously.

PARLIAMENTARY INTELLIGENCE.

PROGRESS OF GAS AND WATER BILLS.

By Wednesday last (the limit of time allowed), memorials had been presented complaining of non-compliance with Standing Orders in the case of the petitions for the following Bills: Lambeth Water-Works (Transfer) Bill, from the Lambeth Water-Works Company and debenture-holders; Southwark and Vauxhall Water-Works (Transfer) Bill, from Southwark and Vauxhall Water Company and debenture-holders; West Middlesex Water-Works (Transfer) Bill, from West Middlesex Water-Works Company and debenture-holders.

The petitions for the remaining Bills in the list in which our readers are interested will therefore go forward unopposed. These are: Bridlington and Quay Water Bill, Brighouse Corporation Bill, Brymbo Water Bill, Hebden Bridge and Mytholmroyd Gas Board Bill, Hebden Bridge Local Board (Gas) Bill.

The Examiners (Messrs. Campion and Thoms) commenced their sittings on Friday; and, as recorded elsewhere, Mr. Campion took up the consideration of the memorial in regard to the Chelsea Water-Works (Transfer) Bill, the allegations in which were not sustained.

LEGAL INTELLIGENCE.

LIVERPOOL CITY SESSIONS—Wednesday, Jan. 16.

(*Before Mr.* C. H. HOPWOOD, Q.C.)

The Liverpool Corporation v. The Liverpool United Gas Company. The Provision of Apparatus for Testing the Illuminating Power of the Gas.

On behalf of the Liverpool Corporation, an application was made to the Recorder to-day, under the Liverpool United Gas Company's Act of 1865 and subsequent Acts, to settle what experimental meters should be provided by the Company to test the illuminating power of the gas supplied to the city and the places where they should be fixed.

Mr. COLLINGWOOD HOPE appeared for the Corporation; Mr. SEGAR for the Gas Company.

Mr. HOPE explained that a difference had arisen between the Corporation and the Company with respect to the provision of experimental meters to test the illuminating power of the gas supplied to the city from the different works of the Company. Prior to the Act of 1865, there were in existence gas-works at Wavertree, Eccles Street, Athol Street, and Caryl Street; but, in addition to those, there were now works at Garston and Linacre. In 1874, the Company, acting upon a request of the Corporation, erected a testing-meter at the Municipal Offices; and it was quite true that since that time only one test had been made. Following the example of the London County Council, the Liverpool Corporation had lately adopted the use of portable photometers, and from these unofficial tests had ascertained that the gas supplied ranged from 14·10 to 23 candle power. He pointed out that in 1874 the city was largely supplied with gas manufactured in the city; and one testing-meter was then deemed sufficient. But since then new works outside the city had come into existence; hence the necessity for the present application.

Mr. SEGAR stated that the Corporation had full access to the testing apparatus at all the Company's works. His point, however, was that the Recorder had no power to deal with this matter, seeing that in 1874 the Company and the Corporation, through their Engineers, agreed that one testing-meter would be sufficient, and that that one should be erected in the Municipal Offices. The Act of 1865 stated definitely that the fixing of testing-meters had to be settled within twelve months; and that, if this was not done by agreement, then the Recorder was to be approached. The necessity for coming before the Court was, however, avoided by the agreement between the parties, who decided as to whether one or more meters was necessary. Having thus determined the matter, he submitted that the Recorder had no power to accede to the application of the Corporation. Then, if his Honour did not agree with him on that point, he must ask that the application be postponed until next Sessions, in order that the Company might have time to go into the merits and facts of the case.

After further discussion,

The RECORDER was of opinion that there ought to be an adjournment, because he would like a little time to consider the full force of the various Acts bearing on the point.

Mr. HOPE said he would not object to an adjournment, if the Company would agree not to supply any water gas to the city in the meantime.

Mr. SEGAR: Will the Corporation take the responsibility of the town being in darkness?

Mr. HOPE: I do not think that would follow.

Mr. SEGAR: We could not give such an undertaking. It would mean the closing of the Garston works.

The RECORDER said he would prefer that the matter should be settled by arrangement. Here was a Company with the sole and exclusive right of supplying a city with gas, and there was a public body appointed to watch the interests of the community. That public body, thinking there was not full evidence as to whether the Company were doing their duty, desired to take some means to secure its being done. The Company, he understood, utterly refused anything of the sort. Under the circumstances, he would adjourn the application to the next session.

BRENTFORD COUNTY COURT.—Tuesday, Jan. 15.

(*Before His Honour Judge* BAGSHAWE.)

Grand Junction Water Company v. Neal—The Use of Water for Gardens.

In this case, the Grand Junction Water Company sued Mr. F. Neal, of Woodville Road, Ealing, for 10s. 6d., a moiety of a charge for water used by him for "other than domestic purposes." The defendant is the owner of his house, and attached to it is a garden, in which he put up a stand-pipe, and, by means of a hose, employed

the Company's water for gardening operations. When written to by the Company, and asked to enter into a special agreement for this use of their water, he raised the contention that, inasmuch as his garden and house were rated under one assessment and upon one joint annual value, the Company were not entitled to make any such demand.

Mr. A. J. RAM appeared for the plaintiffs; Mr. F. K. MUNTON represented the defendant.

Mr. RAM, in stating his case, contended that the Company relied upon the 48th section of their Act of 1852, which expressly defines what were not to be considered domestic purposes—watering gardens being specifically mentioned among them. The Company being dissatisfied last year with the abuse of their supply, issued notices and advertisements that they would not allow water to be used for other than domestic purposes, except by meter or by agreement; and in the latter case, the fixed rate for the summer season would be one guinea. In accordance with this notice, they charged the defendant 21s., payable in two equal moieties. In support of his contentions, Counsel cited the case of *The Bristol Water-Works Company v. Uren*,* the judgment in which ruled that the defendant must abide by his agreement with the Bristol Company to pay for the use of the water for gardening purposes.

Mr. MUNTON argued that the nature of the defendant's garden was such that it might be considered as a fit and ordinary one to be joined to a house in such a locality as Ealing; and it was incumbent on the plaintiffs to show that it was an exceptionally large one. He contended that the Bristol Company's case was quite in his favour. In the judgment in that case, Lord Justice Smith said that, where water was used for the "amenities" of a house, such as in cases of watering an ornamental or ordinary garden surrounding or attached to a house, the water used in the garden might be legitimately considered as being used for the purposes of the house. The defendant, however, in the Bristol case, had contracted with the Company to pay; and he was bound by the contract. In the present instance, the defendant had from the first repudiated any agreement; and the words in the judgment applied exactly to him. The plaintiffs were seeking for power to say to a person: "You shall not put water on a garden, no matter if you get it from a special tap or not"—a state of things which he suggested was never intended by their Act.

His HONOUR held that, as section 48 of the plaintiffs' Act not only limited ordinary supply to domestic purposes, but expressly excluded a supply "for gardens" (which might be the subject of separate contract), the only meaning which could be given to the statute was that, although the annual assessment of the premises was arrived at as they stood—*i.e.*, the house and a garden admittedly not of an exceptional size (the severing in the value of which was not contemplated by the General Act of 1847), the defendant was as much bound to pay an extra garden rate as he was to pay a special rate for a fixed bath, notwithstanding that it was inside a house fully rated as a whole. The words of the statute supported the plaintiffs' contention.

The claim was accordingly allowed, with costs on the usual scale of a test case; liberty, however, being reserved to the defendant to appeal, if so advised.

Action for Damages against the Carlisle Corporation.

At a recent sitting of the Carlisle County Court, His Honour Judge Stevenson had under consideration a case in which Mr. J. C. Atkinson, a house furnisher, sued the Mayor, Aldermen, and Councillors of the city for £12 15s. damages for loss sustained through some goods being injured by the negligence of one of the defendants' workmen. Mr. Cavanagh appeared for the plaintiff; and the Town Clerk represented the Corporation. Mr. Cavanagh stated that the action was brought to recover damages for injury occasioned through the flooding of the plaintiff's premises by the negligence of one of the Corporation servants. The water was turned off outside the premises at the meter last February; but in April, at night, a servant of the Corporation turned on the water, thereby flooding the premises. Two chalk marks placed near the meter by the man who turned on the water showed that there was a leakage to be noticed by the inspector when he came round. The plaintiff deposed that last February he had the water shut off at the main because his lavatory was out of order. In April the place was flooded through the water being turned on again; and some furniture was damaged. He saw two white cross marks in chalk over each stopcock outside his premises. In cross-examination, plaintiff stated that the water was turned off in February by a plumber, at the stopcock in the street, by his orders. He did not give notice of this at the water office, because he had had it turned off before when there was a leakage. The cistern overflowed in February; and this was why he had the water shut off. There was also a burst pipe on the premises. Neither the pipe nor the cistern was repaired after the turning off of the water. The reason he did not send a request to the water-works for the water to be turned off was that he assumed the stopcocks in the street were put there for the convenience of householders. W. H. Hill, an assistant at the plaintiff's shop, deposed that he asked the water inspector what the chalk marks indicated on the lids of the stopcocks; and he told him that very likely the marks had been put there by one of their men. The Town Clerk submitted that he had no case to answer. His Honour held that he had no evidence that the water was turned on by a servant of the Corporation; and he should enter a nonsuit, with leave to apply for a new trial if additional evidence as to the turning on of the water was obtained.

The Public Lighting of Newcastle.—At a meeting of the Police Sub-Committee of the Newcastle Corporation last Tuesday, it was reported that the City Lighting Committee had forwarded to the Newcastle and Gateshead Gas Company a communication to the effect that, if the Company would give the Corporation a discount upon the cost of gas consumed in the streets of the city, the partial lighting in the summer months would be discontinued. A letter had been received in reply; the Gas Company agreeing to give the discount. It was, under these circumstances, agreed that the lamps should be lighted during the whole of the summer months of each year.

* See JOURNAL, Vol. XLIV., p. 854; and Vol. XLV., pp. 586, 633.

MISCELLANEOUS NEWS.

ELECTRIC LIGHTING NOTES.

The application of the Bath Electric Lighting Company for a Provisional Order is to be opposed by the Town Council, who have resolved to ask the Board of Trade for an Order to confer upon them the necessary powers for carrying out an electric lighting installation. This decision was come to at a special meeting of the Council yesterday week, upon the motion of Alderman Sturges, who said the general public feeling was in favour of such things as the electric light, gas, and water being under the management of the Corporation. The only opponent to the resolution was Alderman Tuckett, who, referring to the works the Company have at present in operation, declared that they had been put down in the cheapest form possible, because money at the time was very scarce. The Company possessed a "bad egg;" and, in his opinion, they wanted to force the hand of the Council, and get rid of it quickly. He also believed that, if the Corporation obtained a Provisional Order, it would mean a loss and expense to the city.

The delay in getting the electric lighting plant into operation has been productive of much discussion at Cardiff. The matter was again before the County Borough Council yesterday week; a motion being proposed by Mr. Good, asking for the appointment of a Special Committee "to make a searching and impartial investigation into the cause or causes of the late extraordinary and vexatious delay in completing the electric lighting of the town, and as contrary to the statement made both by the Electrical Engineer and the Borough Surveyor, according to the minutes of Sept. 19, 1893, that the said lighting should be carried into effect either in December, 1893, or January, 1894." The motion was regarded as a most reasonable one by Alderman T. Rees; but Mr. Beavan and the Mayor (Alderman P. W. Carey) denounced it as a reflection upon the Lighting Committee—the Mayor being of opinion that the Council might as well pass a vote of censure on the Committee as to agree to the motion. Mr. Jenkins asked for information as to whether the Council had had to pay for the experiments at the station in the shape of wages and the cost of the coal. To this his Worship replied that the men were employed permanently at the station. Latterly, experiments had been carried on during the period in which the street lamps had been lighted, besides which they had 39 private customers! They had afforded light to these customers, and had used their coal for this purpose. Applications for the light were coming in "fairly well" now; but he was sorry to say that the people of Cardiff had not taken it up in the way they ought. On being put to the vote, the motion was lost.

The completion of the Halifax Corporation's electric lighting works has been celebrated by the contractors and workmen and those officially connected with the undertaking dining together. The toasts which, according to the established mode, are proposed on such an occasion were duly honoured; the principal one, of course, being "Success to the Electricity Works." The proposing of this was placed in the hands of Mr. T. Greenwood, one of the members of the Council. In the course of his remarks, he claimed that the installation was "second to none in the world." The works had been carried out for about £6 per light; while those of the Liverpool Electric Supply Company had cost £8. He also stated that at the present time they had applications for 3000 16-candle lamps. The present capacity of the works, in round figures, was 5000 lamps; and he appeared to be confident that, before three years are over, this will be utilized to its fullest extent. The Chairman of the Gas and Electric Light Committee (Alderman J. Brook) replied to the toast, and expressed his belief that the town was now on "the high road to success" in regard to the electric light. They were, he said, deriving from the present number of lights an income of quite £2000; and in a short time he expected the concern would be really a paying one. On this point, the Electrical Engineer (Mr. T. P. Wilmshurst) gave those people who are doubtful as to the ultimate success of the works some encouragement by pointing to what has been done at Manchester, Leeds, Hull, and Bradford. Where the comparison comes in, is not altogether clear.

An important decision was arrived at on Monday last week by the Lighting Committee of the Liverpool Corporation. In view of the recent action of the Council, empowering the Committee to enter into negotiations for the purchase of the Electric Supply Company's undertaking, various matters appertaining to the lighting of the city were under discussion; but a new departure in the consideration of the question was initiated by a proposal that the Corporation should make application to the Board of Trade for a Licence to enable them to light the streets of the city by electric light, and, if need be, to supply electricity in the same way as is now being done by the Company. It is understood that this proposition gave rise to an animated debate, and that it was only adopted by four votes to three. It is rumoured that, in consequence of this decision, the Company have intimated to the Corporation that they have broken off all negotiations.

The Local Government Board having sanctioned a loan of £19,000 for carrying out the electric lighting scheme of the Walsall Corporation, that body has accepted tenders for the supply of plant for the generating station at £5061; for the supply and laying down of the electrical mains, at £3998; and for the construction of a generating station at the Wolverhampton Street Gas-Works, at £1750.

WALSALL CORPORATION GAS SUPPLY.

New Borrowing Powers—The Price of Gas.

At the Monthly Meeting of the Walsall Town Council yesterday week, the Gas Committee recommended that the Town Clerk be directed to request the Local Government Board to include in the Provisional Order for which application has been made to them to amend the Local Acts of 1876 and 1890, power for the Corporation to borrow, when necessary, an additional sum not exceeding £50,000 for the purposes of the gas undertaking, the amounts previously authorized—viz., £100,000 and £50,000—having been borrowed, with the exception of

£2500. This additional capital, the Committee pointed out, should all be productive, and tend to reduce, and not increase, the rates. This was agreed to, on the proposition of the ex-Mayor, seconded by Mr. Cope. On the further recommendation of the Committee, the tender of Messrs. J. & S. Roberts for supplying an independent gas-main to connect the Pleck Gas-Works with the gasholders at the Wolverhampton Street Gas-Works, for the sum of £792, was accepted. In proposing this, Mr. Brownhill remarked that until the connection was made, it would not be possible to shut up the Wolverhampton Street works. When they were closed, he believed gas would be made at a cheaper rate than at present. Alderman Evans observed that he had expected to find in the report an intimation that the price of gas would be reduced—a promise to that effect having been given twelve months ago; and if the Chairman could not assure the Council that it would be lowered, he should give notice of a motion on the subject. The ex-Mayor said the Committee were not yet in a position to make any announcement on the subject. The gas accounts not having yet been audited, the Committee were unable to say whether the sum which they had promised to pay over in relief of the rates had been earned. If it had been, the price would be reduced. Alderman Newman added that the Council had used the sum which the Gas Committee had promised—viz., £5000 in reduction of the rates; and until that amount was earned, the charge could not be lowered. Alderman Brownhill expressed the opinion that a reduction would be made at the end of the current quarter. The Town Clerk remarked that they had been passing through a bad time; and the Council had desired to ease the burdens of the ratepayers by transferring £5000 from the profits of the gas concern to the Corporation. If the £5000 had not been earned, the deficit would have to be made up out of the rates. The matter then dropped.

ILFRACOMBE GAS SUPPLY.

Threatened Opposition to the Gas Company's Bill.

Opposition is threatened to the Bill which the Ilfracombe Gas Company are promoting, particulars of which were given in the JOURNAL last week, on the ground that the removal of the Company's works to the proposed new site at Hele will ruin one of the attractions of the neighbourhood, and be detrimental to the interests of the community. Last Saturday week, the Rev. Prebendary Martin presided over a public meeting of the inhabitants of the town, which was called to consider the question. He urged that the matter was of the utmost importance, because, while Ilfracombe had not much seabeach, there was a prospect that the Gas Company would practically ruin the beach at Hele, and deface one of the most beautiful drives out of the town. It was, of course, desirable to have the gas-works removed; but even this might be paid for too dearly. Another question to be considered in the same connection was whether the works should not be purchased by the Urban District Council; and if this were contemplated, it would be better that the Company's Bill should not pass. Mr. J. R. Dowson moved—"That this meeting of the ratepayers of the parish of Ilfracombe urges upon the District Council the extreme importance, in the interests of the town, of immediate action in opposition to the Bill which is being promoted by the Gas Company." Mr. G. N. Maull supported the motion, and said it appeared to him that Ilfracombe was to suffer in order that outlying parishes might be supplied with gas. Dr. Gardner, a member of the District Council, said he objected to the suggested removal of the works to Hele, and also to the proposal of the Company to close an existing road and make a new one. Altogether, the advantages proposed to be conferred by the Company were not sufficient to compensate for the loss to be sustained; and it would be less objectionable to enlarge the present works than to start new ones at Hele. Mr. R. Bowden aroused considerable opposition by contending that the objection came too late. The Company had, he said, bought the land for the new works, and could not be prevented from doing what they wished. There could not be a better place than Hele, though he hoped the District Council would treat with the Company, and secure the foreshore. Mr. R. Barrett thought the Company's main idea was to save the cost of cartage and the pier dues now paid at Ilfracombe. The scheme was, however, objectionable; and if the town was to get no benefit, the Bill ought to be opposed. Mr. H. Brand, another member of the District Council, said this body had carefully considered the Bill, and did not, he believed, intend to oppose it absolutely, but proposed to suggest modifications. The motion was carried with two dissentients; and a copy was ordered to be sent to the Council.

THE SHEFFIELD CORPORATION AND THE LITTLE DON WATER SCHEMES.

A Special Meeting of the Sheffield City Council was held last Wednesday, for the purpose of authorizing opposition in Parliament to the Water Bills which are being promoted by the Barnsley Corporation, the Dewsbury and Heckmondwike Water Board, and the Rotherham Corporation.

Alderman GAINSFORD, the Chairman of the Water Committee, moved a resolution to the effect that it was expedient for the Council to oppose in Parliament all or any of the Bills deposited for the session of 1895 by the Corporation of Barnsley, the Dewsbury and Heckmondwike Water Board, and the Corporation of Rotherham respectively, for (among other things) obtaining powers to take water from the River Porter or Little Don, or tributaries thereof, and giving the necessary authority for the opposition. In support of the resolution, Alderman Gainsford explained the position of the case. On a large map he pointed out the several reservoirs at Redmires, Rivelin, and Loxley. These, he said, including the Damflask, were the reservoirs which the Council possessed at the present moment; and assuming that the Damflask would prove to be (as he hoped it would) a good reservoir, they were calculated to supply all the wants of Sheffield until 1905. Then they came to an end of all the reservoirs that they had either constructed or had in process of construction. Next they would have to proceed with those reservoirs which they had sanctioned, but which were not yet in course of construction—those in the Ewden Valley, the Broomhead reservoir and the Moorhall reservoir. This utilized all the gathering-ground; and it was calculated, assuming that the rate of progress of Sheffield would be in the next 20 or 25 years equal to what it had been in the last 20 or 30 or 40 years, that the Ewden system would give a supply of water enough to last to 1920 or 1925. Then they would come to the end of the whole of the water supply which they had either in existence or authorized; so that it would be seen that Sheffield, and the large population outside for which they were under an obligation to supply water—numbering, he thought, altogether about 370,000—had only at present an authorized supply of water sufficient to last for about 25, or at the longest for 27 or 28 years. He did not think, therefore, that they could quietly look on, and see any part of the water in their gathering-ground in the Don Valley abstracted and taken for the use of other populations. The three Bills to be introduced proposed to deal with the portion of the areas in the watershed of the Little Don river which come down to Deepcar. Rotherham had not formulated any definite scheme, but had clauses in their Bill proposing to take powers to enable them to promote a Bill in a future session of Parliament within the next two years. They were not exactly asking to construct works, but were going very near it; and it would be a very considerable failing on the part of Sheffield to allow that sanction to be obtained without saying something about the matter. Beyond that, Dewsbury and Barnsley actually proposed to make reservoirs and to take the water. This was enough to show the Council, he thought, that at this stage it was impossible for Sheffield to stand by, and allow the water to be abstracted. But at the same time, if any means, reasonable and proper, were to be found to avoid the useless expenditure of the ratepayers' money—either the ratepayers of Sheffield or any other town—for his own part he would be glad to see any such means found. But, speaking personally, he was of opinion that any proposals of that kind, with regard at any rate to the Bills of Barnsley and Dewsbury, should come from the other side, and not from them. Rotherham stood in a different position. Rotherham was itself in the valley of the Don; and the waters of the Don were the only sources to which Rotherham must look for its water supply. Therefore one would be foolish not to admit that Rotherham was in a different position from the others. It would be sufficient to say, with regard to Rotherham, that negotiations were taking place between the Sheffield Water Committee and the Corporation of Rotherham, as to which he hoped the Water Committee would be in a position to report to the Council before long.

Alderman W. J. CLEGG seconded the motion, which, after a few remarks from other members, was carried unanimously.

THE GUISELEY DISTRICT COUNCIL AND THE WATER-WORKS.

Local Government Board Inquiry.

Colonel J. O. Hasted, R.E., held an inquiry at Guiseley last Wednesday, on behalf of the Local Government Board, relative to the application of the District Council for sanction to borrow £11,000 for the purpose of purchasing the undertaking of the Guiseley Water Company and for constructing additional works. Mr. Newstead, the Clerk of the Council, in stating their case, said the Company had been in existence for thirty years. Complaints had been made from time to time, especially of late years, as to the quantity, but not the quality, of the water supplied; and representations had been made to the Company by the Local Authority, asking them to augment the supply. These representations ended in an offer by the then Local Board to purchase the works; and it was ultimately accepted by the Company. The offer was that the Board should pay par value for the shares, and also take over the loans owing by the Company; the total of the purchase-money being £8159. The remainder of the £11,000 was needed for the purpose of renewing some of the pipes, constructing a reservoir capable of holding a million gallons of water, and doing other necessary work to make the plant as efficient as possible. Evidence was given in support of the application by the Medical Officer of Health (Dr. Cheetham), and by Mr. A. E. Preston, the Engineer advising the Council. The latter gentleman described the existing works of the Company, which, he said, consisted of a circular reservoir capable of containing 100,000 gallons, and drifts and wells, the minimum yield of which, when he gauged them during the last three months of 1893, was 40,000 gallons per day. This would give about 12 gallons per head of the population, and was, he thought, ample for a place like Guiseley. In the winter months the yield would be greater than 40,000 gallons. Mr. Preston also described the proposed new works. Mr. G. D. Parkinson, one of the Directors, gave evidence as to the incorporation of the Company in 1860, and the creation of the share capital, also stating that for fifteen years a dividend of 5 per cent. had been paid. The revenue had increased during the past five or six years. Later in the proceedings, it was alleged that some of the Company's supplies were of a very precarious character, as they had gained no legal right to them, and were liable to have them interfered with at any time; but, on behalf of the Company, it was urged that, by user for a period of above thirty years, the Company had acquired a possessory title sufficient to give them an absolute ownership of the drifts in private property, and also an easement for the support of these drifts.

New Joint-Stock Companies.—The Algeciras Water-Works Company, Limited, has been registered with a capital of £20,000, in £20 shares, to acquire and turn to account a concession granted by the Municipality of Algeciras, in Spain, for the right of distribution and sale of water in that town. The Sunlight Incandescent Gas-Lamp Company, Limited, with a capital of £15,000, in £5 shares, has been started to put into effect an agreement, made with L. Oliver, and to carry on business as manufacturers and dealers in lamps, burners, gas mantles, glasses, shades, and all materials in connection with gas and electric lighting and fitting.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The disastrous affair which happened in Glasgow last Saturday, by which seven persons lost their lives, and of which I gave an account in my last week's "Notes," turned out, as I anticipated, to be caused by coal gas. It was a melancholy, as well as a serious affair. A whole family of seven huddled into one room below the level of the street, is a state of matters which cannot be contemplated without a feeling of pity for the poor persons who are obliged to live amidst such forbidding surroundings. In this case, however, the element of sympathy is very largely discounted by the fact that the man who elected to expose himself and family to such a wretched existence was quite able to have provided himself with something far better. He was a shoemaker, in a situation where there was abundance of work; and being a good workman and industrious, he was accustomed to earn, on an average, 25s. a week all the year round. Yet he lived in a house the rent of which was only 7s. 9d. per month. The health of the inmates of such a dwelling as his must have been greatly weakened; and that might to some extent account for their falling easy victims when exposed to the fumes of the gas. But when this view is taken of the matter, there is surely also ground for believing that there is something exceptionally poisonous about Glasgow gas. In no other city in the kingdom, so far as my observation goes, are there so frequent, and in some cases so appalling, losses of life from gas poisoning. I am writing from memory; but my recollection is that less than a year ago a gentleman in a good position in life, sleeping in a large and airy room, was found dead in bed in the morning. In that case the cause of death was that the gasalier had dropped, or been pulled down, allowing the gas to escape freely. Shortly afterwards, a waiter who lay down in the afternoon upon a bed in a bedroom of a hotel, was found dead two hours later; and death was attributed to gas poisoning—the single burner in the room being found turned full on unlighted. In the middle of June last, five women were found dead in bed; the result of their house having been invaded by gas, owing to the fracture of an old disused pipe. Last November, a family of five were found unconscious from the effects of inhaling gas which had got into their residence, from a broken pipe also. These all recovered. Then there is the present disaster. Even since it occurred, there has been another, though happily not attended with fatal results. Yesterday morning a workman who lives in the St. Rollox district awakened about two o'clock; and noticing a smell of gas he lighted a candle, and tested the gas-pipes in the room, by the flame. Finding nothing amiss, he went into a small bedroom where his three children were in bed, and found them to be unconscious. A medical man was called; and under treatment they recovered. A 2-inch gas-pipe which passes down the entry to the building was found to be fractured; and the escaping gas forced its way through the partition wall, formed of a single brick, which separates the passage from the bedroom. It is noteworthy that in this case, as in the one a week ago, there was a light in the room; but there was no explosion, which showed that the proportion of gas to air must have been very small. Mr. W. Foulis, the Engineer, is making an inquiry into the circumstances connected with last week's case; and so is the Procurator-Fiscal of the city. Between them, there will surely be something elicited regarding the composition of the gas; and of the two I should say that Mr. Foulis, as being the better scientist, is more likely than the public officer to look into the matter. I had almost omitted to mention that in the case of a week ago, the cause of the sad affair was the fracture of a gas-main in the street, about two or three feet from the window of the house. The fractures are attributed to the recent frost.

Besides these sad events, the recent severe frost has been the cause of other, and less serious occurrences. In Linlithgow, on Saturday night last, there was a partial stoppage of the gas supply; and in Edinburgh on Monday night, about 1100, or nearly one-tenth, of the public lamps would not light. In both cases the cause is attributed to water accumulating in the pipes after the thaw.

The Falkirk Gas Commission held their first meeting on Monday. Mr. Thomas Wilson, Manager of the Coatbridge Gas Company, was appointed to act for the Commissioners in the valuing of the stock at the gas-works. The Commissioners have intimated to the Gas Company that they are desirous of retaining all the workmen at present employed at the gas-works. With regard to the Manager (Mr. Peter B. Watson), a different procedure was adopted. In his case, Provost Griffiths was appointed to prepare a series of questions to be put to Mr. Watson, regarding the management of the works and the changes he would recommend, before they should consider whether they would retain his services or not. The meeting was adjourned till Friday night, in order to allow Mr. Watson's answers to be got. Before adjourning, however, the Commissioners resolved to borrow £90,000 from the Royal Bank of Scotland, at the rate of 2¼ per cent. per annum, which are certainly very favourable terms. A talk was afterwards indulged in of issuing Corporation stock at 3 per cent., with premium; but nothing came of the proposal. A Clerk and a Treasurer were also appointed—both officials being already burgh officers—at the modest salaries of £30 and £40 respectively. On Friday night the farce of submitting the Provost's catechism to Mr. Watson was gone through. It was mercifully taken in private; so the world is not likely to know what was the nature of the queries which a non-technical and inexperienced body like the Commissioners put to Mr. Watson, who has filled the post of Gas Manager in the burgh for 13 years. I daresay, if they could be procured, they would make very entertaining reading; but it is perhaps better that they should not. There has been enough of the comic element in this transfer already. It is, however, a gratification to know that Mr. Watson, after the ordeal of being subjected to examination and cross-examination as to his proposed policy, received the unanimous support of the Commission, and was appointed to be Manager of the undertaking under the Commissioners, on the same terms as at present. It reads very singular to find on Monday night how they proceeded cautiously in the filling up of the post, as if they felt it might be somewhat unsafe to give it to Mr. Watson; and that then, on Friday night, after the appointment was made, the Provost glowingly trusted it might be a great success, that they might soon have a reduction in the price of gas, and a better quality of gas than they had had for some time. It is to be hoped that all these things may happen; but it would have been prudent to have waited till they came to pass before introducing them. The Commission have a great deal of work to do, before they can apply much thought to lowering the price of gas—that is to say, if they wish to manage the gas undertaking intelligently.

It is gratifying to learn that in Perth the consumption of gas goes on increasing. For the year to date, there is an increase upon the consumption over the same period of last year of 5,644,000 cubic feet, or 9·74 per cent. The report submitted by the Manager (Mr. Thomas Whimster) to the Commissioners on Monday, stated that the retort capacity of the gas-works was 103 mouthpieces, and that only 10 retorts have been unlighted during this winter. Should the present rate of increase be maintained, all the retorts will be in use next winter; leaving no reserve for a breakdown. This was a subject which Mr. Whimster thought claimed immediate attention. In supplement of Mr. Whimster's report, Mr. Wright, the Convener of the Works Committee, said that, if they were to meet the requirements of the city efficiently, it would be necessary to erect new gas-works within a few years. It had been computed that entirely new works could be erected for £33,000, which included £2000 for a site, £15,000 for buildings, £3000 for removal from the present site, £9000 for a new gasholder, £3000 for contingencies, and £1000 for parliamentary expenses. They could not, he contended, go on extending the works in Canal Street; and if they were to be kept there it would be necessary to erect a new gasholder at the Shore, at a cost of £9000. He moved that it be remitted to the Gas Committee to consider the whole question, with power to call in an Engineer for advice and guidance. This, after some conversation, was agreed to.

Notwithstanding the unpleasantness which has been found to exist between the Dunbar Gas Commissioners and their last two Managers, no fewer than 31 gentlemen applied to them for the post recently vacated by Mr. M'Kechnie. The Commissioners assembled on Wednesday night to make the appointment. They met without any preparation; and the method they adopted for selecting the man they wished, was by each submitting lists of several names, and then retaining, for after-voting, those which appeared most frequently in the lists—a plan which is not much less ingenious than would have been a plain toss up. As it was, this species of drawing lots led the Commissioners' choice to fall upon Mr. Richmond, of Whitburn, in Linlithgowshire; and he was appointed.

The Paisley Gas Commissioners have, for this season, given up the proposal to introduce oil and water gas plant into their works. A Sub-Committee, who had been appointed to make inquiries on the subject, reported that after inspecting various processes, they were favourably impressed with the apparent simplicity and the general excellence of the Lowe system in use at the Belfast Gas-Works. They obtained estimates from the patentees as to the cost per 1000 cubic feet of gas by this process; but they found that it would exceed the present cost of providing 27-candle gas by 3·17d. per 1000 cubic feet, which, on their annual make of gas, would amount to a loss of £3764 a year. As, however, not more than half oil and water gas could be made, the annual loss would be but half that sum, or £1882. The Commissioners could not be expected to throw away this amount every year; and so, at the request of the Sub-Committee, they have delayed dealing with the matter for another twelve months, pending developments in methods of manufacture.

Sulphate of ammonia is to-day reported to be selling well at £11 2s. 6d. per ton, for spot delivery.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Jan.* 19.

Sulphate of Ammonia.—The market here has exhibited increased firmness; and there is a pronounced advance in values. Dealers have been eager buyers, and there has been a clearance of all parcels placed on the market. Now that a turn has arrived, consumers at home and abroad may shortly come in to buy, as, owing to the low prices, very few contracts have been entered into by makers for forward delivery, so that the requirements for Spring delivery are almost entirely unprovided for. There is a very steady feeling at the close; and any lower prices are not now likely—in fact, there is every probability of values being carried to a higher level. Some forward business is reported at £11 7s. 6d. Leith. The quotations to-day are £11 2s. 6d. to £11 5s. buyers; but makers expect better rates.

LONDON, *Jan.* 19.

Tar Products.—No change of any importance has occurred in this market during the past week. Benzols are still dull and unsaleable; while the future of pitch, which has been the backbone of the tar trade during the past few months, is very uncertain. The low price of coals, and the general depression of trade (which seems to extend to Continental fuel-consuming districts, as well as in England), points to lower values for this article. Creosote and tar oils generally are dull. There is more inquiry for solvent naphtha; and toluol maintains its value. Buyers do not seem to have educated themselves yet to the higher prices asked for carbolic and cresylic acids. Anthracene keeps firm at Committee rates. Business has been done during the week at the following prices: Tar, 17s. 6d. to 21s. 6d. Pitch, 32s. Benzols, 90's and 50's, 1s. Solvent naphtha, 1s. 2½d. Toluol, 1s. 3d. Crude naphtha, 30 per cent., 4½d. Creosote, liquid, 2d.; ordinary, 1½d.; salts, 18s.; pressed, 40s.: Cresylic acid, nominal, 1s. Carbolic acid, 60's, 1s. 8d. Anthracene, "A," 1s. 1½d.; "B," 10½d.

Sulphate of Ammonia.—The improvement noticed last week in this article is fully maintained. There are many inquiries; and stocks are by no means abnormal. Sales of important quantities have taken place at prices ranging between £10 15s. and £11 5s., less 3½ per cent.; while gas liquor is quoted at 7s. to 9s. per ton.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—A fair amount of activity continues so far as the better qualities suitable for house-fire purposes are concerned; but except that this is enabling pits to work rather more regularly—in many cases about five days per week—the increased demand has no appreciable effect upon the market. The output is ample to supply all requirements—in fact, some of the railway sidings in the district have been blocked with the extra supplies which have been sent forward; and prices have been not more than maintained at list quotations. Best Wigan Arley is not fetching more than 10s. 6d. to 11s. per ton at the pit; Pemberton four-feet and seconds Arley, 10s. to 10s. 6d.; and common house-coals, 8s. to 8s. 6d. The lower qualities of round coal met with no materially increased inquiry for general manufacturing purposes; but with the extra demand for house-fire consumption, supplies are perhaps not quite so excessive as they have been. At the pit mouth, ordinary qualities of steam and forge coal average about 6s. 6d. to 7s. per ton. The shipping trade is, however, only quiet; and common steam coal, delivered at the ports on the Mersey, can still be readily bought at 8s. per ton, with better qualities at about 8s. 6d. The higher qualities of engine fuel are moving off fairly well; but the commoner sorts continue a drug. Prices still range from 3s. and 3s. 6d. per ton for the inferior descriptions, to 4s. 6d. and 5s.

Northern Coal Trade.—There is again a little better demand for some classes of coal, as the storm diminished the deliveries, whilst it also increased the consumption. Best Northumbrian steam coals are in very slow sale; and the prices have been very irregular—varying from 8s. 9d. to 9s. per ton f.o.b. Second-class coals are from 8s. to 8s. 3d. per ton. Steam smalls are very abundant; and have been sold at very low prices to prevent "teaming" or stocking at the collieries—as low as 2s. 6d. per ton being named. This is an unprofitable price, as so much of it would be taken for the carriage from the colliery. Gas coals are being delivered on old contracts in very large quantities; and there have also been larger deliveries to the local companies. Prices of gas coals are still on the basis of 7s. 3d. to 7s. 9d. per ton f.o.b. Manufacturing coals are depressed and dull. In regard to coke, the local furnaces are fully employed; and this steadies the market, though the exports are small. Prices range from 13s. to 14s. per ton f.o.b. Gas coke is being largely made; but the demand for export increases, which has enabled some of the gas companies to obtain slightly advanced prices for the large contracts they make with manufacturers.

Scotch Coal Trade.—Business does not improve; and the feeling is growing that if matters do not mend wages must be reduced next month. The miners are anxious to work; but, on account of the want of orders, they cannot get full time. Foreign trade is very dull; prices being still too high for purchasers. There is consequently a slight tendency to a decrease in prices. Ell is the only variety which it is supposed there is anything like a cheerful outlook for; the demand for it being expected to improve. Splint is in small request; the expectation of purchasers being that as the season advances it will get cheaper. The same may be said of steam coal. The quotations are: Main, 6s. 6d. to 6s. 9d. per ton f.o.b. Glasgow; ell, 7s. 3d. to 7s. 6d.; splint, 7s. to 7s. 6d.; and steam, 8s. to 8s. 3d. Shipments amounted to 101,197 tons—an increase upon the quantity in the preceding week of 31,210 tons, but a decrease as compared with the corresponding week of last year of 28,153 tons. For this year, the total shipments have been 171,184 tons—a decrease as compared with the same period of last year of 50,516 tons.

The Failure of the Promoter of the British Water-Gas Company.—In the London Bankruptcy Court on Monday last week, particulars were issued of the affairs of Mr. J. C. Cottam, described as a company promoter and financial agent. They were accompanied by observations of the Official Receiver (Mr. G. Wreford). The debtor returns his liabilities at £103,936, of which £5436 are unsecured; and there do not appear to be any available assets. He states that he commenced business about 1884, with a capital of £1000, and subsequently traded in partnership with others. During the last ten years, he has been interested in the promotion of various companies, and has incurred heavy losses as the result. The Official Receiver observesth at the debtor has not filed a deficiency account as required; but in a statement now lodged by him, he attributes his failure entirely to losses in connection with a water-gas company and other companies. The unsecured liabilities include about £420 for borrowed money, £1313 for law costs, and £493 for advertising and printing. Contingent liabilities, £100,000, of which £1500 is expected to rank, are stated to be in respect of the debts owing by a firm in which the debtor was a partner. He has been required to furnish particulars of these liabilities.

The Assessment of the Belfast and District Water-Works.—The Belfast City and District Water Commissioners have adopted a report of the Finance Committee dealing with the question of the assessment of the water-works. It stated that, upon the application of the Town Clerk of Belfast, the Commissioner of Valuation had assessed a valuation of £17,000 upon the reservoirs, mains, and pipes which had not heretofore been valued or rated. Of this sum the amount placed on the city was £6398; and the balance of £10,602 would be placed on that part of the union of Belfast which was outside the city, and on the unions of Larne and Lisburn in which the works were situated. The effect of this valuation would be to render the Commissioners liable to an annual payment for rates of, in round figures, £3500—equal to a rate of about 1½d. in the pound, while the actual proportion of this sum payable to the Belfast Corporation would only be £1706 2s. 8d.; the balance being payable for poors' rate and county cess in the above-mentioned unions. The Committee had pointed out to the valuation department that the Commissioners' works were held for public purposes; and that therefore the valuation should be returned in the list of exemptions. The Commissioner of Valuation declined to accede to this view. The Committee, therefore, directed that steps should be taken to have his decision reviewed.

Boston (U.S.A.) Water Supply.—The Chief Engineer of the Massachusetts State Board of Health (Mr. F. P. Stearns) has lately explained to the authorities of the various places interested, the scheme which has been prepared for supplying Boston and the district with water. He proposes to draw the metropolitan supply from the watershed of the Nashua River above the town of Clinton, Mass. It has an area of 118 square miles; and the overflow is to be impounded by a dam 129 feet high and 1250 feet long, forming a reservoir with an average depth of 46 feet and an area of about 6½ square miles. From this reservoir the water is to be drawn through an aqueduct 9 miles long into the existing Sudbury system of works. The cost is estimated to be $17,400,000, against $28,400,000 for a supply from Lake Winnepesaukee, which was proposed at one time.

Suggested Supply of Sea Water to London.—At the meeting of the London County Council last Tuesday, Lieut.-Col. Ford moved a resolution to refer it to the General Purposes Committee to consider and report on the feasibility and desirableness of securing a supply of sea water for London, with a view to its use for sanitary purposes. He said that in a great many towns sea water was employed for road watering and for flushing sewers, with the best results. The Borough Engineer of Liverpool had written him to the effect that sea water answered better for road watering than fresh water, and that it could be procured much more cheaply. It was also better than fresh water for flushing sewers and for extinguishing fires. Mr. Torr seconded the motion. Mr. J. Burns, M.P., said he hoped the Council would not adopt the suggestion. The water would lose much of its virtue in transit; and to supply London with the quantity required meant an expenditure of from £20,000,000 to £25,000,000—a very much larger sum than it would cost to run the London sewer outfalls out to sea. The motion was rejected.

The Oswestry Town Council and the Gas Company.—Concerning the proposal of the Oswestry Gas Company to advance, by 5s. per lamp, the charge for lighting the streets, and the objection of the Corporation thereto (as recorded in the JOURNAL for the 11th ult.), Mr. D. Askin, the Secretary of the Company, has written to the Town Clerk, pointing out that the Directors considered they were fairly entitled to what they had asked for. They had very good reasons for making the increase; and they regretted that they were not allowed an opportunity of explaining them. He compared the price charged with those of Shrewsbury, Wrexham, and Liverpool, from which it appeared that it was not excessive. The letter gave rise to a discussion at the last meeting of the Council. Mr. Williams said there had been a good deal of talk about starting new gas-works for the town. Before, however, going into the matter, he would suggest that the Council should communicate with the Oswestry Electric Lighting Company, with a view, if it were thought advisable, of taking over their powers. Mr. Smith complained that the quality of the gas during the past month had been very bad; and he thought that representation should be made to the Company to the effect that the inhabitants were dissatisfied with the illuminating power. He was sorry it was not mentioned in the report that the Borough Surveyor had received instructions to prepare plans and find a suitable site for new gas-works for the town. The Mayor (Mr. G. Perks) pointed out that the matter was adjourned. Mr. Smith said his impression was that the Council ordered it to be done; and Mr. Tyley understood that a Committee were to report upon it. In reply to Mr. Whitfield, Mr. Smith said they had no standard illuminating power, as the Company were not under an Act of Parliament; and they could sell gas at their own price. The discussion terminated with the adoption of a proposition of Mr. Ellis, that the Town Clerk write to the Company and complain of the bad state of the gas, and asking that it might be improved.

The Water Supply Question at Chester.—The report of the Special Committee of the Chester Corporation on the water supply of the city and the steps which should be taken to remove all sources of danger to it, was discussed by the Council at their last meeting. An epitome of the report appeared in the JOURNAL for the 25th ult., together with the principal recommendations of the Committee. The first of these suggested the provision of an intercepting sewer for the south side of the city, to prevent the sewage from that quarter being turned, in a raw state, into the River Dee below the weir; and, in the second, the Corporation were advised to apply to Parliament for an Act enabling them to put into force the powers of the Rivers Pollution Prevention Act in respect of all pollutions of the river and its tributaries from their sources downwards. These the Council now decided to refer respectively to the Sewering Committee and the Local Government Act Committee. With regard to the third recommendation—"that the Water Company should be required to provide sufficient water storage, so as to render it unnecessary to take water out of the river at all during the time it is under the influence of tides which flow over the weir or during the time of floods from above"—the Mayor (Mr. W. H. Churton) said he was sure the Council would all admit that the Company had been doing, for some years past, most admirable work in endeavouring to give the inhabitants the best water supply it was possible to get. He was glad as Chairman of the late Committee to express his testimony to the great satisfaction given to the whole of the members by what the Company had accomplished. They had spent a large amount of money in raising the water-tower and securing a better pressure, in order to be able to supply the whole city and surrounding districts. They had also adopted—and he said this without exaggeration—the best system of filtration it was possible to have at the present moment; and in other ways they had done much to help them with the water supply. The Committee, however, were not quite satisfied that the matter should rest there so far as they were concerned. They felt that the present storage for water was very limited, and should be largely extended, as they were anxious that the Company should be independent of the river when a big tide was going up, or flood running down. He saw no difficulty except the question of expense. He was not going to suggest what course the Company should take; but he moved that the third recommendation be courteously sent to the Directors, with a request that they be asked to take it into consideration, and reply to the Council after so doing. The proposition was adopted.

The Transfer of the Belper Water-Works to the Local Board.—The Local Government Board have granted their sanction to the acquisition of the water-works by the Belper Local Board; and the purchase will now be completed as speedily as possible.

Redruth Water Supply.—The members of the Redruth Urban District Council who are opposed to the scheme of water supply adopted by the late Local Board brought the question to the arbitrament of a vote yesterday week. Mr. J. Hicks, who, with certain other members, declined to serve on the Water Committee when it was appointed a week or two ago, now proposed that an inquiry should be held into the scheme. He contended that it was incomplete, because it would not supply houses in the higher part of the town, and that it would be defective, because the site of the reservoir was porous, and was over old mine workings. As an alternative to the present scheme, he said there was, within a stone's throw, an adit from which they could pump pure water, and send it direct into the town, for £30; but instead of this they were spending £4600. They might have ten times 4½ million gallons of water, if they went down 20 fathoms below the top of the granite, and there constructed a dam; so damming the water back for a mile, and constructing a natural reservoir. Dr. A. E. Permewan said the Local Board had the matter under consideration for twelve months, and discussed every possible point. The plans were prepared by their own Engineer; and they had been considered by some of the most experienced men in the country, who had come to the conclusion that the scheme was as satisfactory as the circumstances would permit. They had, moreover, let the contract for the work; and it was too late now to talk of retracing their steps. Mr. A. Carkeen said the water would by gravitation reach nearly all the houses in the town; while, as to the reservoir, the chances were very great that it would be one of the best in the country. In the course of further discussion, Mr. Hicks stated that the contractor was not unwilling to withdraw from the job. The Council, however, rejected his resolution by 8 votes to 7.

The Oil-Gas Experiments at the Bradford Gas-Works.—The Secretary of the Northern Counties Hydro-Oxygen Gas Company, Limited (Mr. J. E. Gresty), has replied, in the *Bradford Observer*, to the letter by Dr. Dvorkovitz which we reproduced from that paper in last Tuesday's JOURNAL. He charges the Doctor with giving an "incomplete extract" from the Bradford Gas Engineer's report; and he submits the following as the full one: "The Northern Counties Hydro-Oxygen Gas Company, Limited, Huddersfield, offer to erect an oxy-oil gas plant, complete, at any of our works on the following terms: The Company to work the plant for five years, and the Corporation to pay them one-half the saving in cost of enrichment calculated upon the basis of 1¼d. per candle per 1000 cubic feet. According to the estimate of the Company, we should save upon this basis in enrichment one-third of £20,149, or £6716 per annum, according to the showing of which amount they propose that we should pay them one-half, or (say) £3358." Mr. Gresty says, in regard to this matter: "We made an alternative offer to the Bradford Corporation on a basis merely of royalty; the Corporation putting down our plant, at their own expense. Had the Corporation accepted this offer, the royalty payable to this Company would have been about £2000, specially reduced for the first three years to half this amount." He goes on to point out that the initial cost of putting down the plant was to be borne entirely by the Company; and the profits to be derived were therefore dependent absolutely upon the saving to the Corporation in the cost of enrichment—half of such saving belonging to the Company, the other half to the Corporation. He accuses Dr. Dvorkovitz of distorting words by calling this amount "cost." He goes on to say that the offer of the Company was made on the strength of the success of their system at the Huddersfield Gas-Works, where it is to be applied to the enrichment of the entire output of gas. He concludes with a few statistics taken from the concluding portion of the paper read by Mr. W. R. Herring before the Manchester District Institution of Gas Engineers in August, as given in the JOURNAL at the time.

The Unification of the Malverns and the Water Supply.—Mr. J. W. Willis Bund, the Chairman of the Worcestershire County Council, has concluded his inquiry into the question of the proposed amalgamation of the Malvern districts. He commenced hearing the evidence in March last; but the matter has been adjourned from time to time chiefly in order that he might be satisfied that the new water scheme of the Malvern Local Board (who are the petitioners) would be adequate for the united districts. At the final sitting a few days ago, Mr. Copland, the Engineer of the new water-works, was recalled by Mr. Balfour Browne, and supplemented the evidence he gave at the previous hearing, as recorded in the JOURNAL for Oct. 30 last. He stated that he made some experiments on one day, towards the end of November, to ascertain how much water passed from the north and Wyche reservoirs to the town. From these experiments, he calculated that from Jan. 18 to Dec. 31, 34 million gallons were supplied. He was convinced that there must be a great deal of waste; and he had recommended the Board to fix meters to the pipes, with the view of discovering where the waste was, and also with the view of future economical management of the works. Those meters had been obtained, but had not yet been fixed. During the period mentioned, they had stored 42 million gallons of water; making a total stored and supplied to the town of 76 million gallons, which was equal to 9·004 inches of the rainfall off a drainage area of 280 acres from Jan. 18 to April 2, and 387 acres from April 2 to Dec. 31. The absorption into the sides and banks of the new reservoir, witness estimated at rather more than 4 million gallons; but this they would not lose again. They had caught one-third of the total rainfall, which was what he had calculated on from the beginning of the scheme. Deducting the compensation water, and after giving Malvern a sufficient supply for the year, they would have 33 million gallons. The cost of the water-works was £37,600; and the difference between this and the £51,500 which had been previously stated as the cost was accounted for by the parliamentary expenses and the outlay on land. Mr. Bund remarked that he did not think it fair that experiments for one day only should be taken, as the conditions on various days would change; and, at the conclusion of the evidence, he promised to have his report prepared for an early meeting of the County Council.

Reduction in Price.—The Directors of the Folkestone Gas Company have determined to reduce the price of gas on April 1 next from 3s. 3d. to 3s. per 1000 cubic feet. This reduction represents a saving of £2300 a year to the general consumers, and of £330 a year in respect of the supply to the Corporation for the public lamps.

Gas and Meter Testing in Leeds.—Mr. C. Buckley, the Inspector of Gas and Gas-Meters to the Justices of the Peace of the City of Leeds, has submitted to them his annual report upon the work done in his department. Dealing first with the examination of meters, he says that during the year 9928 were tested, of which 9275 were found correct, and 655 were rejected, or 6·59 per cent., as against 7·13 per cent. in 1893. The testing fees amounted to £302 4s. Compared with the previous year, there was an increase of 143 in the number of meters tested. From the Corporation, 6001 repaired meters were received; being 147 less than in 1893. From the same source, there were above 1000 new meters less; but this was more than recouped from other quarters. Regarding the illuminating power of the gas, Mr. Buckley reports that he has tested it, at the various stations provided by the Corporation, the following number of times: York Street, 88 times; Sheepscar, 87; Kirkstall, 84; Wortley, 87; Dewsbury Road, 97; and Wortley gas, Dewsbury Road, 10. The total number of tests at all the stations was 453; and the gas was found to be below the standard of 18 candles 176 times. The illuminating power at each testing-station was as follows: York Street, 18·08 candles; Sheepscar, 17·48; Kirkstall, 17·95; Wortley, 18·08; Dewsbury Road, 17·88; Wortley gas, Dewsbury Road, 18·23—the average for the year being 17·95 candles. The number of times the gas was below the standard at each station was: York Street, 25; Sheepscar, 75; Kirkstall, 14; Wortley, 14: Dewsbury Road, 48; Wortley gas, Dewsbury Road, none. The lowest tests recorded at the various stations were: York Street, 16·89 candles; Sheepscar, 16·07; Kirkstall, 15·66; Wortley, 15·51; Dewsbury Road, 17·14: Wortley gas, Dewsbury Road, 18·09. The highest test was at York Street on Feb. 27, when it was 19·60 candles. This, compared with the previous year, shows a slight improvement; the average for 1893 being 17·88 candles, against 17·95 candles this year. The percentage of times below the standard last year was 39·60; this year, 38·85.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 165.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	**GAS COMPANIES.**				£ s. d.
590,000	10	11 Oct.	10½	Alliance & Dublin 10 p. c.	10	20—21	..	5 0 0
100,000	10	,,	7½	Do. 7 p.c.	10	13½—14½	..	5 3 5
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	100	103—105	..	4 15 3
200,000	5	14 Nov.	6½	Bombay, Limited	5	6¼—6¾	..	4 16 5
40,000	5	,,	6½	Do. New	4	4¾—5	..	5 4 0
980,000	Stck.	15 Aug.	11½	Brentford Consolidated	100	235—240	+2	4 15 10
180,000	,,	,,	8½	Do. New	100	185—190	..	4 9 6
220,000	Stck.	28 Sept.	11	Brighton & Hove Original	100	217—222	..	4 19 1
888,500	Stck.	30 Aug.	5	Bristol	100	115—120	..	4 3 4
320,000	20	28 Sept.	11½	British	20	48½—49½	..	4 10 10
50,000	10	30 Aug.	11½	Bromley, Ordinary 10 p. c.	10	21½—22½	..	5 2 2
51,510	10	,,	8½	Do. 7 p. c.	10	16½—17½	..	4 17 2
328,750	10	14 Nov.	2	Buenos Ayres (New) Limited	10	6—6½	..	3 1 6
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	100—103	+1	5 16 7
150,000	20	12 July	8	Cagliari, Limited	20	27—28	..	5 14 3
550,000	Stck.	11 Oct.	13	Commercial, Old Stock	100	275—280	..	4 12 10
165,000	,,	,,	10	Do. New do.	100	200—205	..	4 17 7
160,762	,,	13 Dec.	4½	Do. 4½ p. c. Deb. do.	100	130—135	..	3 6 8
800,000	Stck.	13 Dec.	13	Continental Union Limited	100	240—245	..	5 6 1
200,000	,,	,,	10	Do. 7 p. c. Pref	100	205—210	..	4 15 3
535,000	Stck.	30 Aug.	5	Crystal Palace Ord. 5 p.c. Stk	100	117—122	..	4 1 11
486,090	10	27 July	11	European, Limited	10	23—24	..	4 11 8
354,060	10	,,	11	Do. Partly paid	7½	16—17	..	4 17 1
5,646,590	Stck.	15 Aug.	12	Gaslight & Coke, A, Ordinary	100	260—265	−3	4 10 6
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	105—110	..	3 12 9
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	279—284	..	3 10 5
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	130—135	..	3 14 1
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	200—205	..	3 13 2
1,300,000	,,	,,	7	Do. H, 7 p. c. max	100	182—187	..	3 14 11
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	275—280	..	3 11 5
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	100	165—170	..	3 10 7
1,061,150	,,	13 Dec.	4	Do. 4 p. c. Deb. Stk.	100	127—130	..	3 1 6
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	135—140	..	3 4 3
908,000	,,	,,	6	Do. 6 p. c. do	100	188—192	..	3 2 6
3,800,000	Stck.	14 Nov.	12	Imperial Continental	100	229—234	..	5 2 7
75,000	5	13 Dec.	6	Malta & Mediterranean, Ltd.	5	5—5½	..	5 9 1
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	100	110—112	..	4 9 3
541,920	20	14 Nov.	5	Monte Video, Limited	20	15½—16½	+½	6 1 2
150,000	5	29 Nov.	8	Oriental, Limited	5	7—7½	..	5 6 8
60,000	5	13 Sept.	7	Ottoman, Limited	5	4¼—4¾	..	7 7 4
166,870	10	31 Jan.	2	Pará Limited	10	1¾—2⅛	..	8 0 0
				People's Gas of Chicago—				
420,000	100	2 Nov.	6	1st Mtg. Bds.	100	103—108	..	5 11 1
500,000	100	1 Dec.	6	2nd Do.	100	100—105	+2	5 14 3
150,000	10	11 Oct.	6	San Paulo, Limited	10	8½—9½	..	6 6 4
500,000	Stck.	30 Aug.	15½	South Metropolitan, A Stock	100	340—345	..	4 9 10
1,350,000	,,	,,	12	Do. B do.	100	288—293	..	4 1 11
260,000	,,	,,	13	Do. C do.	100	293—298	..	4 7 2
750,000	,,	16 Jan.	5	Do. 5 p. c. Deb. Stk.	100	167—172*	+½	2 18 2
60,000	Stck.	30 Aug.	11½	Tottenham & Edm'nton, "A"	100	225—230	..	5 0 0
				WATER COMPANIES.				
746,021	Stck.	28 Dec.	1⅞	Chelsea, Ordinary	100	287—292	..	3 9 4
1,719,514	Stck.	11 Oct.	8	East London, Ordinary	100	235—240	4 2	3 6 8
654,740	,,	28 Dec.	4½	Do. 4½ p. c. Deb. Stk.	100	150—155	..	2 18 0
700,000	50	13 Dec.	8½	Grand Junction	50	121—123	+⅛	3 9 1
708,000	Stck.	15 Aug.	12	Kent	100	307—312	+2	3 16 11
1,043,800	100	28 Dec.	9½	Lambeth, 10 p. c. max.	100	268—273	..	3 9 7
406,200	100	,,	7½	Do. 7½ p. c. max.	100	205—210	..	3 11 5
350,000	Stck.	28 Sept.	4	Do. 4 p. c. Deb. Stk.	100	135—138	..	2 17 11
500,000	100	15 Aug.	12½	New River, New Shares	100	393—398	+3	3 0 11
1,000,000	Stck.	27 July	4	Do. 4 p. c. Deb. Stk	100	140—145	..	2 15 2
902,300	Stck.	13 Dec.	6	S'thwk & V'xhall, 10p. c. max.	100	170—174	+1½	3 9 0
126,500	100	,,	6	Do. D 7½ p. c. do.	100	160—165	..	3 12 0
1,155,066	Stck.	13 Dec.	10	West Middlesex	100	277—282	+2	3 10 10

*Ex div.

The General Gas Lighting and Heating Company of Brussels.—The total profits realized by this Company (whose works are principally in Belgium) in the past financial year amounted to 2,299,262 frs., as compared with 2,214,520 frs. in 1892-3. The disposable balance, after deducting sinking fund and other charges, was 965,377 frs. After paying the statutory dividend of 25 frs. per share, and making certain allowances to the Directors and chief officers, a final dividend of 14 frs. per share has been declared; making 39 frs. per share, or at the rate of 7·8 per cent., and leaving 10,436 frs. to be carried forward. The Company's mains now extend to 779,448 metres; and from them are served 17,747 consumers (using 236,422 lights), 13,855 public lamps, 11,534 gas-stoves, and gas-engines to the total of 930-horse power. The quantity of gas sold in the year covered by the last report was 24,039,929 cubic metres (about 848,610,000 cubic feet), as compared with 23,619,599 cubic metres in the previous year.

The Complaints of Nuisance at the Plymouth Gas-Works.—At the meeting of the Plymouth Borough Council on Monday last week, the Sanitary Committee reported that Counsel advised that the Corporation had the power to compel the Directors of the Gas Company to abate the nuisance at their works, of which complaints had been made; and the Town Clerk (Mr. J. H. Ellis) had received instructions to institute proceedings for the abatement of the nuisance. The Town Clerk read a letter from the Secretary of the Company (Mr. Thomas), stating that the Directors had placed iron shutters in the doors and windows of the retort-house, which had effected considerable relief with regard to the smoke and dust. They also intended to fix screens, which had been found useful in other places. The writer added: "The Directors are fully cognizant of the importance of this subject. They will spare neither effort nor expense to abate or remove any cause of complaint. They venture to hope there would be no necessity to have recourse to other proceedings." Mr. Ellis said of course one would not act unreasonably; and he was sure it would be the wish of the Council that the nuisance should be removed without resort to legal proceedings. The report was adopted.

Gas-Meter Rents in London.—At the meeting of the London County Council last Tuesday, it was referred to the Public Control Committee, on the motion of Dr. Collins, "to consider and report whether the meter-rents charged by the Gas Companies are or are not in excess of what are sanctioned by the statute; and to make suggestions accordingly."

New Water and Sewerage Works for Pembroke.—Under an Order of the Local Government Board, the Pembroke Corporation are to provide Pembroke and Pembroke Docks with a system of underground sewerage within a period of nine months. The Council are approaching their task reluctantly, as it involves not only the provision of the sewerage system, but a larger water supply, and consequently considerable expense. However, a Committee which has been appointed to consider the question have retained Mr. Beesley, of Westminster, to propound a scheme for the water supply of the two towns and the sewerage of Pembroke Dock; and Mr. K. M'Alpin, a local engineer, has been instructed to prepare plans for the sewerage of Pembroke. Mr. Beesley is of opinion that a supply of water quite adequate to the requirements of both towns for the purpose in hand can be obtained from a valley near Milton (about five miles from Pembroke Dock). His proposal is to collect and store the water in that valley; and from there he will pump it into reservoirs constructed at Daisy Hayes, which is something like 270 feet above sea-level. The water will run by gravitation from these reservoirs direct to the two towns. The estimated cost of the water-works, including the pumping engines and accessories, is from £18,000 to £20,000; and the sewage arrangements for Pembroke Dock will entail an additional outlay of between £12,000 and £15,000. The total expenditure, therefore, for water supply and sewerage, omitting the outlay which may be necessary in providing a sewerage system at Pembroke, but including £4850, which is the approximate capital value of the estimated annual outlay on the pumping arrangements, will, according to the rough estimate which the Engineer is stated to have prepared, before developing his plans in detail, be between £38,850 and £39,850.

GWYNNE & BEALE'S
PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 2698.

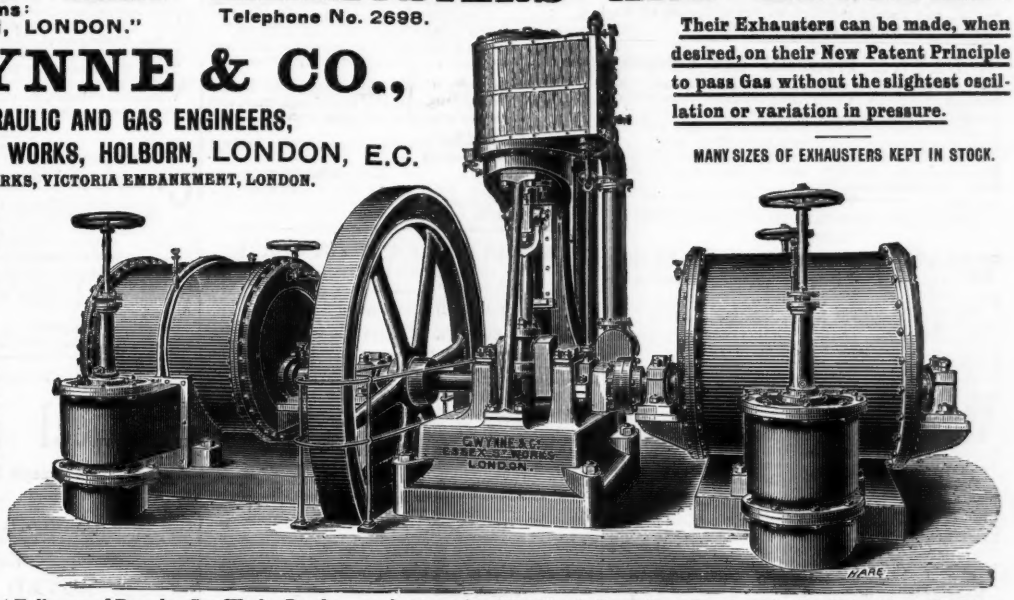
GWYNNE & CO.,
HYDRAULIC AND GAS ENGINEERS,
BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

Late ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON.

They have completed Exhausters to the extent of 32,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, PATENT RETORT-LIDS, STEAM, PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.



Their Exhausters can be made, when desired, on their New Patent Principle to pass Gas without the slightest oscillation or variation in pressure.

MANY SIZES OF EXHAUSTERS KEPT IN STOCK.

Exhausting Machinery at Fulham and Bromley Gas-Works, London—each set passing 400,000 cub. ft. per hour drawing 14 miles distant from Beckton.

Catalogues and Testimonials sent on application.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS, should be received not later than the FIRST POST on SATURDAY.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

JOHN WM. O'NEILL, Managing Director, Palmerston Buildings, Old Broad Street, London, E.C.

ANDREW STEPHENSON, AGENT. All communications *re* Oxide to be addressed to Palmerston Buildings.

WINKELMANN'S "VOLCANIC" CEMENT. Fire Resistance up to 4500° Fahr. In use in most Continental Gas-Works, and in more than 300 British Gas-Works.

ANDREW STEPHENSON, 182, GRESHAM HOUSE, OLD BROAD STREET, LONDON, E.C.

Telegrams: "Volcanism, London."

W. C. HOLMES & CO., Huddersfield; AND 80, CANNON STREET, LONDON, Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.

*** See Advertisement p. 155 of this week's issue.

Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.

First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

Telegraphic Address: "Braddock Oldham."

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JOHN NICHOLSON & SONS, Chemical Works, Leeds, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

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FINEST Quality of Natural Bog Ore. Particulars and price, apply to Mr. T. L. ARCHER 20, Fennel Street, MANCHESTER.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for, Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.

Telegraphic Address: "PORTER LINCOLN."

AMMONIACAL LIQUOR Wanted.
BROTHERTON AND CO., Ammonia Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

GAS TAR Wanted.
BROTHERTON AND CO., Tar Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPENT OXIDE Wanted.
BROTHERTON AND CO., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

BROTHERTON & CO.
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

WANTED, a Situation as Manager of Gas-Works by young, married Man (Abstainer), who will shortly return to England from a seven years' management abroad. Is a good Mechanic, and used to Engine and Exhauster.
Address No. 2474, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, for a Gas-Works, in a rapidly growing district on the East Coast, a young Man as STORES and GENERAL CLERK. Previous experience in Book-keeping necessary.
Apply, by letter, to No. 2175, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

DRAUGHTSMAN.

WANTED, in a large Provincial Gas- Works, a competent DRAUGHTSMAN. Preference will be given to one with a knowledge of Machinery.
Address, stating Age, Qualifications, present Occupation, and Salary required, to No. 2473, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

A LARGE Provincial Gas Company require the services of a Smart Man (one who has had experience in Travelling preferred), whose duty it will be to call on Gas Consumers within their district to induce them to adopt the newest Burners and the best arrangements for Lighting their Premises.
Apply, stating Age, Salary required, and previous Experience, to No. 2471, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SOUTH STAFFORDSHIRE WATER-WORKS COMPANY.

WANTED, a Chief Engineer of this Company. Salary to commence with £600 per annum.
Applications, stating Experience and Antecedents, and containing Testimonials, to be sent to the SECRETARY, at the Office of the Company, Paradise Street, BIRMINGHAM, not later than Twelve o'clock at noon, of Feb. 19, 1895.

WANTED, Two Second-hand Purifiers, 12 or 14 feet square.
Apply to No. 2470, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GOVERNOR WANTED.

THE North Camp and Farnboro' District Gas Company, Limited, require a new, or second-hand, 10-inch GOVERNOR with Inlet, Outlet, and Bye-Pass Valves (Screw-down Valves). Must be in good working order, and guaranteed.
Particulars from the Manager.
Tenders to the undersigned.
JOHN BAKER,
Secretary.
Billiter House, Billiter Street, E.C.

THE Knutsford Light and Water Com- pany invite TENDERS for their production of GAS TAR and AMMONIACAL LIQUOR for the ensuing Twelve Months.
The Company do not bind themselves to accept the highest or any tender.
Tenders to be sent in not later than the 28th inst., to the Chairman of the Company.

TO TAR DISTILLERS AND OTHERS.

THE Directors of the Isle of Thanet Gas Company are prepared to receive TENDERS for about 50,000 to 60,000 gallons of TAR, or less quantity, at their Works at Margate, to be delivered and taken between the 15th of February and the 15th of May next.
The Tar will be pumped into the Contractors' Tanks or Barrels on the Company's Premises, but all other Costs, Dues, or Charges are to be paid by the Contractor; and no question as to the Quality or Quantity of the Tar will be entertained after its removal from the Company's Works. This condition will be strictly adhered to.
Terms: Net Cash within 15 days of date of Invoice.
Any further Information will be given on application to the Engineer and Manager of the Company, Mr. H. H. Jones.
Tenders to be sent in on or before Thursday, the 31st inst., addressed to the Chairman of the Company, and endorsed "Tender for Tar."
The Directors do not bind themselves to accept the highest or any tender.
By order,
THOS. C. FULLER,
Secretary.
Gas-Works, Margate,
Jan. 19, 1895.

SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1759.

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JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
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For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

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Information and Handbook on application.
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SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 315, St. Vincent Street, GLASGOW; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

AMMONIA SATURATORS.

WALTER THOMASON and SONS, Chemical Plumbers, &c., and Makers of Lead Saturators, &c., 21, WESTON STREET, BOLTON. Repairs of every description.
Please write for Estimate before ordering elsewhere.

BOROUGH OF WIDNES.

THE Widnes Corporation are prepared to receive TENDERS for the supply of FIRE-CLAY, CLAY RETORTS, BLOCKS, and BRICKS.
Specifications and Forms of Tender may be obtained from Mr. Isaac Carr, Assoc.M.Inst.C.E., Gas-Works, Widnes.
Tenders, endorsed "Fire-Clay Goods," to be addressed to the Chairman of the Gas Committee, and delivered to the undersigned not later than the 4th of February prox.
The Corporation do not bind themselves to accept the lowest or any tender.
H. S. OPPENHEIM,
Town Clerk.
Town Hall, Widnes,
Jan. 17, 1895.

SHEFFIELD UNITED GASLIGHT COMPANY.
(NEEPSEND STATION.)

TO IRONFOUNDERS, ETC.

THE Directors of this Company invite TENDERS for the Manufacture and Delivery (without erection) of CASTINGS required in the Construction of Four Purifiers, 62 ft. by 20 ft., with COLUMNS and GIRDERS, for their No. 3 Purifying-House.
Drawings may be seen, and Bill of Quantities, with Specification and Form of Tender, obtained, on application to the Engineer, Mr. Fletcher W. Stevenson.
Sealed tenders, endorsed "Tender for Castings for Purifiers," to be delivered (by post) to the undersigned, at the Company's Offices, on or before the 26th day of January next.
The Directors do not bind themselves to accept the lowest or any tender.
HANBURY THOMAS,
General Manager.
Commercial Street, Sheffield,
Jan. 5, 1895.

SHEFFIELD UNITED GASLIGHT COMPANY.
(NEEPSEND STATION.)

TO BOILER MAKERS, CONTRACTORS, ETC.

THE Directors of this Company invite TENDERS for the Manufacture, Delivery, and Erection of Four WROUGHT-IRON PURIFIER-COVERS, 20 feet square, for their No. 3 Purifying-House.
Copy of the Drawing and Specification, with Form of Tender, can be obtained on application to the Engineer, Mr. Fletcher W. Stevenson.
Sealed tenders, endorsed "Tender for Purifier-Covers," to be delivered (by post) to the undersigned at the Company's Offices, on or before Saturday, the 26th day of January next.
The Directors do not bind themselves to accept the lowest or any tender.
HANBURY THOMAS,
General Manager.
Commercial Street, Sheffield,
Jan. 5, 1895.

ILFORD GAS COMPANY.

DESIRABLE INVESTMENTS.

By order of the Board of Directors of the Ilford Gas-light and Coke Company, Limited,

MR. ASHMOLE will sell by Auction, at the Angel Hotel, Ilford, on Thursday, Feb. 7, 1895, at Five for Six o'clock p.m., 800 "B" SHARES, of the nominal value of £5 each, in the above old-established and flourishing Company.
Particulars and Conditions of Sale may be obtained of the SECRETARY of the Company; or of WM. ASHMOLE, F.A.I., Auctioneer, Surveyor, and Estate Agent, ILFORD.

HYDRATED OXIDE OF IRON.

PREPARED from pure Iron
Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.
READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

In Paper Covers, Post Free, Price 2s.

S. CARPENTER on the Purification of COAL GAS from CARBONIC ACID and the SULPHUR COMPOUNDS by LIME, OXIDE OF IRON, and ATMOSPHERIC AIR.
S. & H. W. CARPENTER, 3, Bedford Villas, Carshalton, SURREY.

HORNSEY GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY GENERAL MEETING of the Shareholders of this Company will be held at the Offices of the Company, No. 63, Chancery Lane, in the county of Middlesex, on Friday, the 15th day of February, 1895, at Four o'clock in the Afternoon precisely, to receive a Report from the Directors, declare Dividends, elect two Directors and one Auditor, and transact the ordinary business of a General Meeting.
By order of the Board,
S. J. WILLIAMS,
Secretary.
Offices: 63, Chancery Lane,
London, W.C., Jan. 22, 1895.
The Transfer Books will be closed on the 1st of February until after the General Meeting.

NOTICE.

TO GAS ENGINEERS AND OTHERS.

MESSRS. CLAPHAM BROS., Limited, Keighley, Yorkshire, are no longer authorized to Manufacture my CONDENSER and WASHER-SCRUBBERS.
The above-named Gas Apparatus are erected and giving entire satisfaction at the following places: Neath, Lincoln, Sheffield, Ellesmere, Mountain Ash, Malden, Cullingworth, Montreal (Canada), Woodstock (South Africa), Cape Town (South Africa), &c.
These Appliances can now be obtained solely of the undersigned.
Winchester House, London, E.C. J. A. KELMAN.

NOTICE.

TO GAS ENGINEERS AND OTHERS.

CLAPHAM BROS., LIMITED, of Keighley, Yorks., beg to intimate that they are the SOLE MAKERS of LAYCOCK & CLAPHAM'S "ECLIPSE" WASHER-SCRUBBER, and that no person or persons beyond the Patentees and Makers have ever had any interest whatever in the Patent.
They are also the SOLE MAKERS of CLAPHAM'S PATENT IMPROVED "ECLIPSE" CONDENSER, as supplied to Bradford, Manchester, and other Gas-Works.
Orders and Inquiries promptly attended to. See advertisement in this week's JOURNAL, p. 196.

Foap. 4to, Cloth, price 7s. 6d., post free.

Practical Photometry.

By William Joseph Dibdin, F.I.C., F.C.S.

LONDON: WALTER KING, 11, Bolt Court, FLEET STREET.

Cloth Bound, Price 3s. 6d., Post Free,

THE ROYAL COMMISSION
ON THE
Metropolitan Water Supply
— 1892-3. —

Report of the Evidence (reprinted from the JOURNAL), with comments on the Inquiry, and the Commissioners' Conclusions and Recommendations.

LONDON:
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HARCOURT'S COLOUR TEST.

For Carbon Bisulphide, Sulphuretted Hydrogen, and Carbonic Acid in Coal Gas.

The Materials for the above Tests may be obtained from
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Société de Produits Refractaires
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Rich in Illuminating Power & Yield of Gas.

Above the average in Weight & Quality of Coke.

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PRESENT DAILY PRODUCE OVER 4000 TONS.

LATEST ANALYSIS:—

Yield of Gas Per Ton. . 11,205 Cubic Feet.
Illuminating Power, $16\frac{7}{10}$ Stand. Sperm. Candl.
Coke (of good & pure quality) $13\frac{3}{4}$ Cwt. Per Ton.
Sulphur . . . . A little over 1 Per Cent.
Ash . . . . . Under 1 Per Cent.
Tar . . . . . 163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 103 Lbs. (Avoir.) Per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.

PRESENT DAILY PRODUCE AVAILABLE, 2500 TONS.

RESULTS OF DIFFERENT ANALYSES:—

Yield of Gas Per Ton. . 10,500 Cubic Feet.
Illuminating Power . 17 Stand. Sperm Candl.
Coke (of excellent quality) . $13\frac{1}{2}$ Cwt. Per Ton.
Sulphur . . . . . 1·13 Per Cent.
Ash. . . . . 1·34 Per Cent.
Tar . . . . . 180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor $94\frac{1}{2}$ Lbs. (Avoir.) Per Ton.

The HOLMSIDE and SOUTH MOOR COALFIELD possesses *a very great quantity of the best Coal;* and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*

These Coals may be bought through the Principal Merchants in England, or direct from

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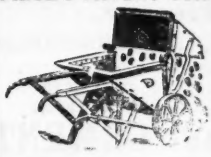

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Available output up to 5000 tons per day. Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

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SEAHAM HARBOUR, COUNTY OF DURHAM.

BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.

Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton . .	10,500	Cubic Feet.
Illuminating Power . .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Bombay Gas Company, San Paulo Gas Company, Ipswich Gaslight Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For prices, &c., apply to the

HARTON COAL COMPANY,

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Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, $1\frac{1}{2}$ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE. — Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

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[MATTHEW MILDRED]

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Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For prices, f.o.b. Ship or Delivered by Rail, apply to

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KENT'S THICK GAS COAL

RAISED AT

The Wharncliffe Woodmoor Colliery,
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Yield of Gas, nearly 12,000 *Cubic Feet per ton of Coal; and Illuminating Power, nearly* 17½ *Candles.*

The following is a complete ANALYSIS made by Mr. R. O. PATERSON, C.E., Gas-Works, Cheltenham:—

Specific Gravity (Water 1)	1·276
Weight of One Cubic Foot	79·700 lbs.

PROXIMATE ANALYSIS.

Moisture in Coal	2·68 per cent.
Volatile Matter	35·60 ,,
Fixed Carbon	58·80 ,,
Sulphur	0·96 ,,
Ash	1·96 ,,

COMMERCIAL ANALYSIS.

Gas per Ton of Coal	11,760 cub. feet.
Gas per Cubic Foot of Coal	418 ,,
Illuminating Power	17·44 candles.
Value of One Cubic Foot in Sperm	418 grains.
Value per Ton of Coal in Sperm	703 lbs.
Coke per Ton of Coal	1367 ,,
Coke	61·05 per cent.
Ash in Coke	3·21 ,,
Sulphur Eliminated with Volatile Products per Ton of Coal	9·4 lbs.
Sulphur in Coke per Ton of Coal	12 ,,
Ammoniacal Liquor per Ton of Coal	19·7 galls.
Tar per Ton of Coal	12·2 ,,

R. O. PATERSON, C.E.

Gas-Works, Cheltenham,
8th August, 1894.

For Price, &c., apply to

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GREATER DURABILITY.

Strongly recommended where EXCESSIVE HEATS have to be maintained.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

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TYNE

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Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

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COAL OWNERS, NEWCASTLE-ON-TYNE
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CONTRACTS FOR SUPPLIES OF ANY OF THE PRINCIPAL
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SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

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THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON AND COAL COMPANY, Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

The Analysis made by Messrs. J. and H. T. Pattinson, Public Analysts for Northumberland, gives 10,500 cubic feet of Gas per ton, with an Illuminating Power of 16·3 Candles and 67·3 per cent. of Coke. The following is a Working Analysis made of these Coals by the Tudhoe and Sunderland Bridge Gas Company:—

[COPY.]

TUDHOE AND SUNDERLAND BRIDGE GAS COMPANY.
Tudhoe Gas-Works,
Spennymoor,
8th June, 1893.

Messrs. The

WEARDALE IRON & COAL COMPANY, LTD.

GENTLEMEN,

For the last two months we have used your THORNLEY GAS COAL exclusively at these gas-works; and I have pleasure in herewith giving you the actual results obtained during the trial.

Yield of Gas per ton: 10,300 cubic feet.
Yield of Coke: 13½ cwt.
Illuminating Power of Gas, average of a series of tests, 17 Sperm Candles.

The Coke was of excellent quality.

The following is a complete ultimate Analysis of the Coal.

	Per Cent.
Carbon	83·128
Hydrogen	5·116
Oxygen	7·401
Nitrogen	0·585
Sulphur	0·620
Ash	3·130
Water	0·020
	100·000

Analysis of the Coke.

Carbon	93·31
Sulphur	0·61
Ash	5·00
Moisture	1·08
	100·00

I am, Gentlemen,
Yours truly,
A. B. COWAN,
Manager.

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QUAYSIDE, NEWCASTLE-ON-TYNE.

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BETTER TERMS CAN BE OBTAINED
FROM SUPPLIERS OF OIL
IF PURCHASERS HAVE THEIR OWN
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TUNBRIDGE WELLS	2	Lifts	112	0	×	35	0
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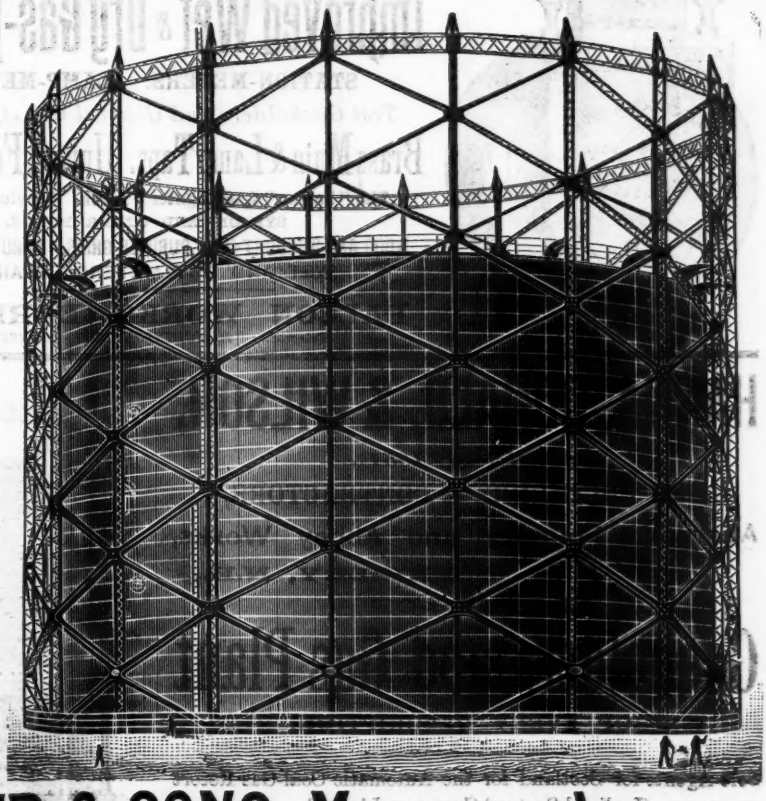
HORNSEY	3	,,	110	6	×	35	0
SOUTHEND	2	,,	90	0	×	25	0
HULL	3	,,	81	6	×	30	0
ST. ALBANS	2	,,	68	0	×	22	0
ROCHDALE	4	,,	150	0	×	34	0
SUNDERLAND	3	,,	150	0	×	32	0
RYDE, I. of W.	2	,,	82	0	×	25	0
COPENHAGEN	3	,,	175	0	×	30	0



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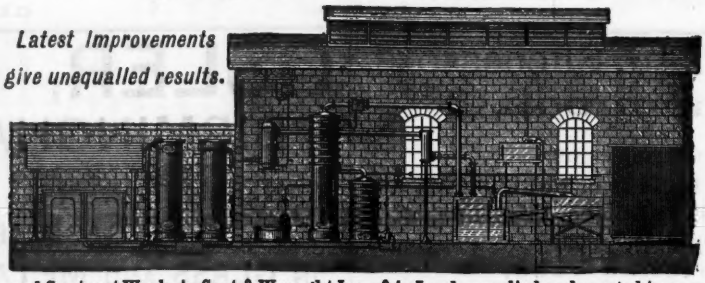

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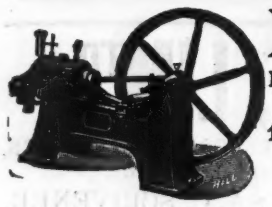

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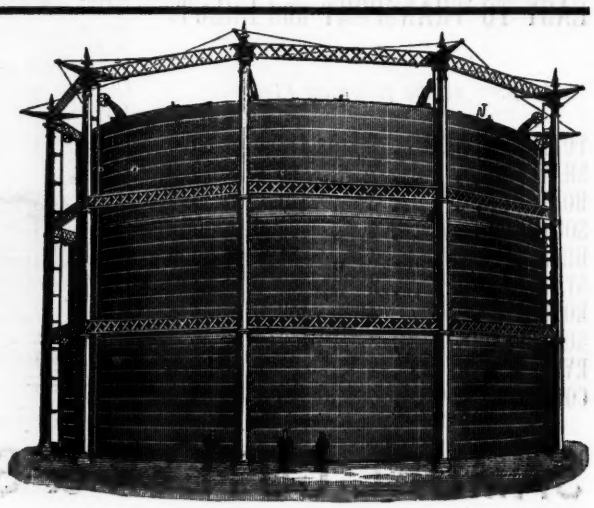

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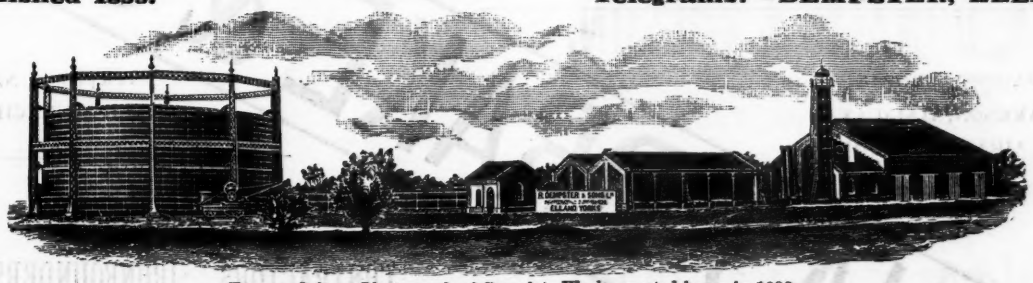

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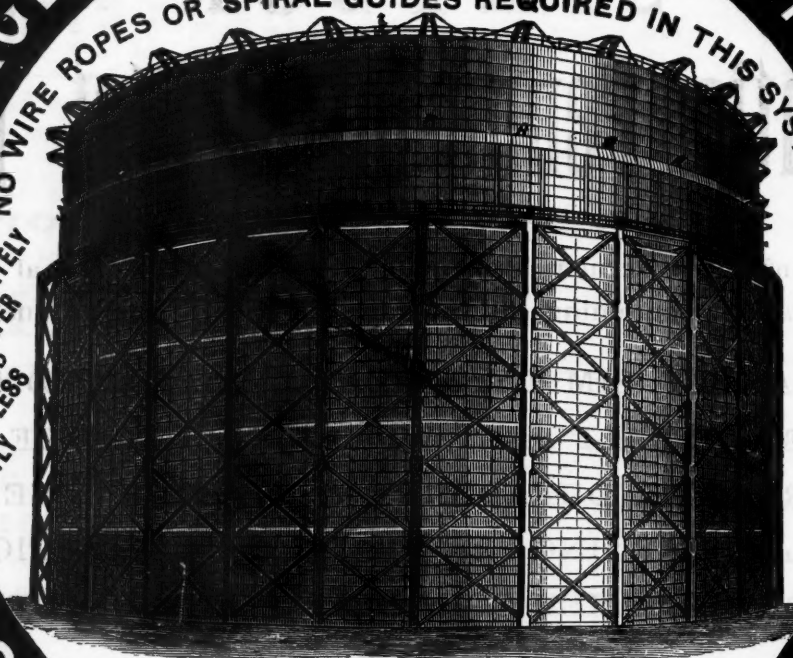

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